

POPULAR MECHANICS MAGAZINE

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SEE PAGE 368

Start to Play Very First Day

This Year Give Yourself
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What greater gift can you confer on your children this year than lifelong fun and entertainment?

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This is the telephone's job and goal

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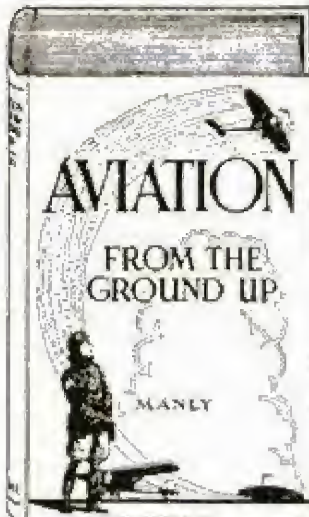
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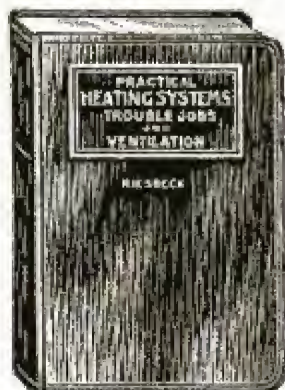
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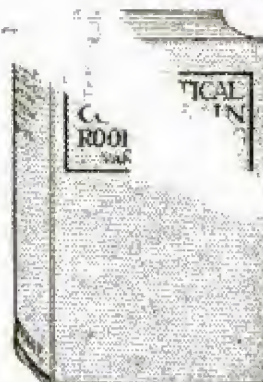
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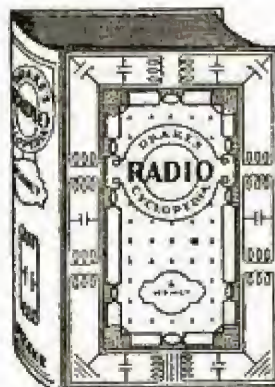
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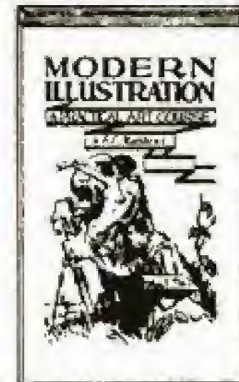
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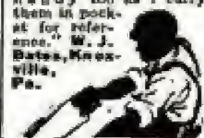
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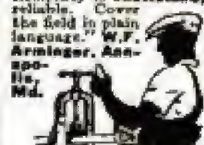
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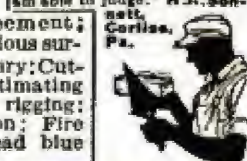
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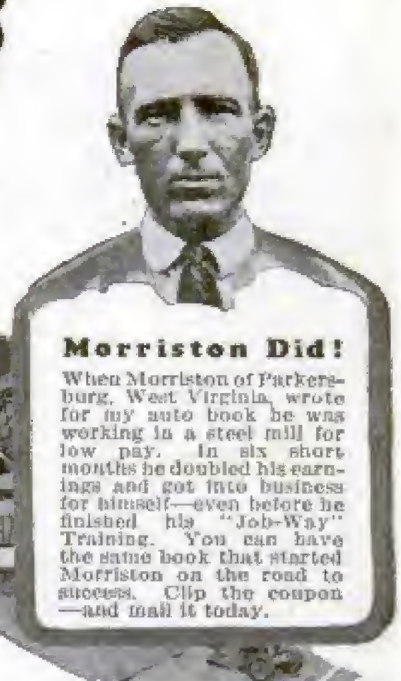
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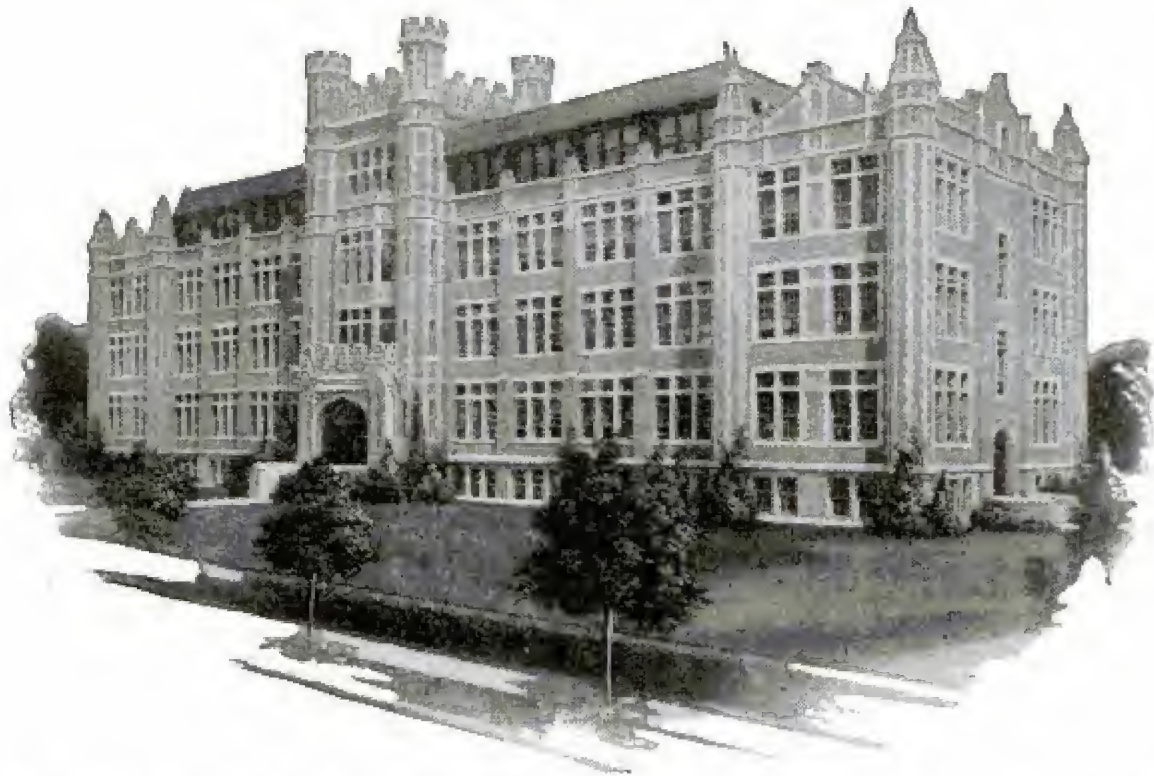
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GO INTO ELECTRICITY

Why stick to a line of work that pays small money and offers but little chance for advancement? Go into Electricity, where the Big Money is being made today,—where there are a Thousand fascinating Big Pay jobs for the Trained Man to choose from.

60,000 new Trained Men are needed in Electricity every year and even this enormous demand is steadily growing larger and more urgent. Instead of turning good men away, as so many other industries are doing, Electricity is literally begging for Trained Men, and offering handsome salaries to get them.

EARN \$60 A WEEK AND UP

Get out of the small pay class. Break away from that disagreeable routine job. Stop worrying about bills and debts and the things you wish you had, but can't afford. Determine NOW to get into a line of work that pays big money, like John Armitage and hundreds of my graduates are making.

As a Coyne Trained Electrical Expert you will have unlimited opportunities to earn \$60 a week and up. Or you can go into business for yourself and make all the way from \$3,000 to \$10,000 a year, as many of my "boys" are doing.

**90 Days
to
SUCCESS**



H. C. LEWIS, President

You don't have to wait until you are an old man to win success. You don't have to wait 12 months, 6 months, nor even 4 months. Just 90 days;—that's all the time I need to make you a Successful Man. Just spend 90 days here with me in my Big Coyne Shops, and your Future is assured. Never again will you have to worry about a job or the size of your weekly pay envelope. Your services will **always** be in demand and you will **always** make good money.

LEARN BY DOING

Not by books or correspondence, but by actual work in my Big Shops on the very same kind of Electrical Equipment that you will find out on the job. In this way you not only learn twice as fast, but you graduate as a trained **PRACTICAL** man, a man capable of stepping into any Electrical job anywhere and proving by his work that he is a trained man.

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You do not need advanced education or previous experience to learn Electricity **my way**. Most of my students never went beyond the grade school and 90% of them knew nothing of Electricity before coming to Coyne. Yet they had no trouble in learning Electricity **through actual work on Electrical equipment**, nor in securing splendid Electrical positions when their 90 days of training were up. And **YOU** can do the same, if you will only let me help you.

FREE EMPLOYMENT SERVICE FOR LIFE

Through our big Employment Department we are in constant touch with Electrical concerns all over the country, and will give you every assistance in locating just the job you want. Employers know that all Coyne men have had **PRACTICAL TRAINING** on the very same Electrical equipment that they have in their plants, and they are mighty glad to have us recommend our graduates to them.

And if you need spare time work to help pay your expenses while at School, we'll help you to get that, too. We'll do everything in our power to help you in every way,—because, after all, your success is our success.

Fill in Coupon on Next Page for FREE Book

If you will act **QUICKLY**, I will give you along with my regular course, and at absolutely no extra charge, a complete special training in Aviation, Radio and Auto Electricity. Also, I'll allow you your railroad fare to Chicago. But to take advantage of these Big Special offers, you must **act at once**.

So clip the coupon, and **mail it today**. Find out how **EASILY** and **QUICKLY** you can prepare for a big pay job. Get my **Big Free Book**, and all the Facts about Coyne Training. This will only cost you a two cent stamp, while it may be the means of bringing you a Better Job, More Money, Happiness and all the good things of life.

My Training Pays!

John Armitage

\$1000 a MONTH!

Dear Mr. Lewis:

No doubt you will be surprised to hear from me, but I am still employed by the same company that I was after I left school—I am pulling down a pretty fair pay check. \$1,000 a month, car furnished and expenses paid when I am away from home. I had 120 men under my supervision on our last job. We just completed a \$150,000 power plant for the Arkansas River Electric Co. I owe my success to Coyne training and always recommend your training.

I hope to be up and see you in February if the opportunity permits. Well I must close as I have some blue prints to run over.

As ever, your successful student.

JOHN ARMITAGE.

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SEND TODAY FOR MY BIG FREE BOOK THAT STARTED JOHN ARMITAGE ON THE ROAD TO SUCCESS.

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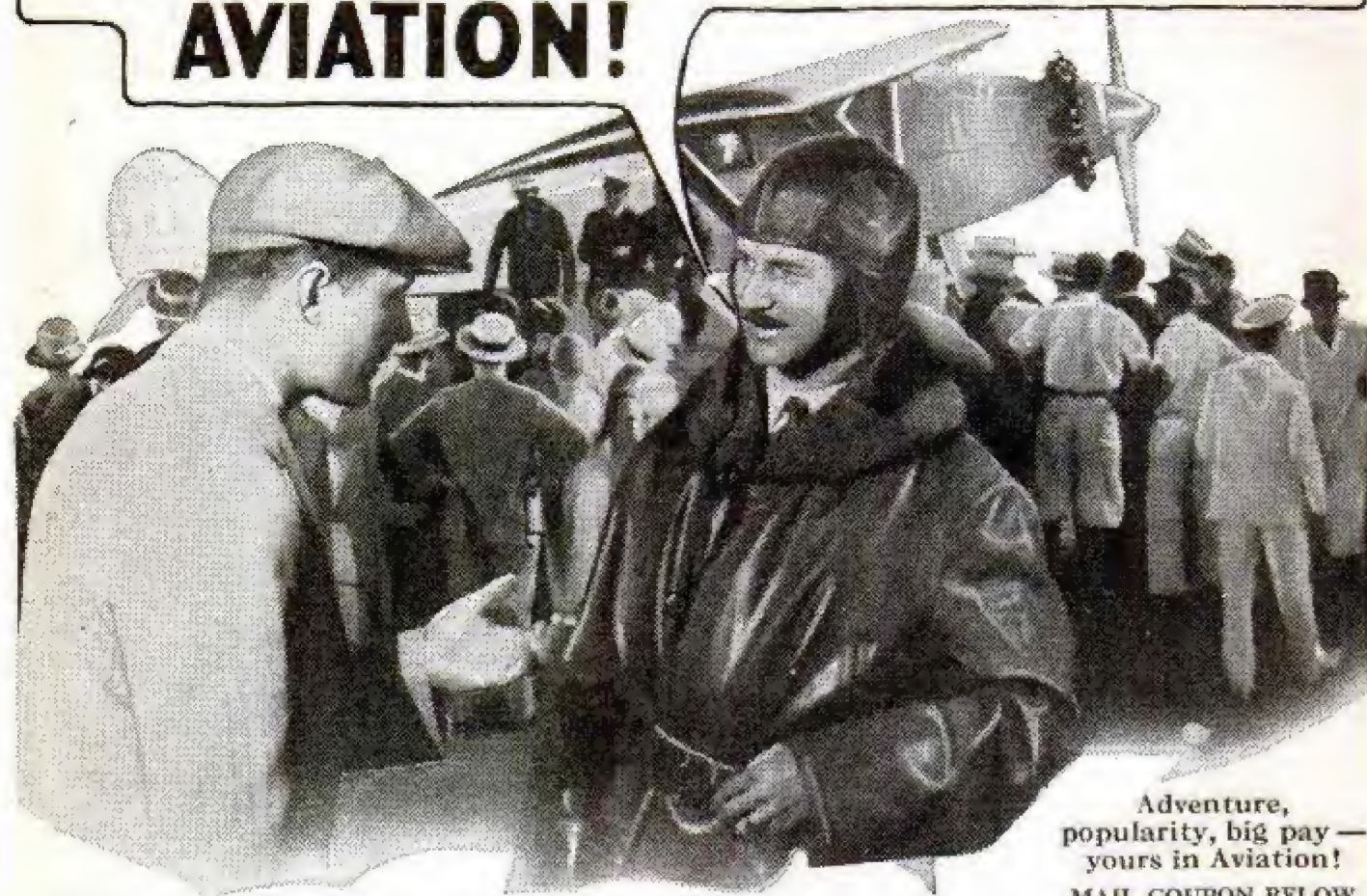
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HERE'S THE QUICKEST WAY TO BREAK INTO AVIATION!



Adventure,
popularity, big pay—
yours in Aviation!
MAIL COUPON BELOW

Wanted:—Daring Young Men!

"SO you want to break into aviation, eh? Why?"
"Because I feel like a caged bird slaving away in a stuffy office or smelly shop. I want to get out in the open air. I want thrills, adventure, popularity, excitement! That's what aviation offers red-blooded men, doesn't it?"

"You bet, but that's not all. There's big money in this game, now and in the future. Air travel is revolutionizing transportation. In a short time you'll see big freight and passenger liners soaring between New York and San Francisco. And the men who jump in now ahead of the second guessers will get first chance at the big pay jobs. But first tell me this—have you had any aviation training?"

"Well, no. I thought I could get all my training here."

"Listen, buddy. Let me save you a lot of time and grief. If you want to break into aviation the right way, get your preliminary training first before you ask for a job."

"Do you know how to control an airplane? Can you read an air map, an inclinometer, an altimeter? How would you take off? How does the weather affect flying? These and a hundred other things you should know before you look for a job in aviation. They haven't got time around a busy aerodrome to give you this basic training."

"Why don't you take up a home study course in the basic fundamentals of aviation? All the known principles of aviation are down on paper. And they're easy to absorb—and mighty fascinating. Then when you're finished training, you'll find it twice as easy to get a job—and you'll be promoted twice as fast as the untrained men. Hey, Bill! What's the name of that aviation school in Chicago? That's it—American School of

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"I think that the letter that you sent to my employer had great weight in his decision to employ me. I like the position that I have very well."
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William Roy Elrod



"I thank you ever so much for your assistance in helping me in getting located in electrical work. As a result of your assistance I am now with the Virginia Public Service Company. My future work will be reading meters and helping install refrigerators."
Sam Ray
South Boston, Virginia.



"I appreciate your efforts in helping me get a job. I have accepted a job with the Franklin County Light & Power Co. of Farmington, Mo. The job is running a two generator power plant."
Austin R. Choff
69 Pine St., Madison, Mo.

"Mr. William Olsasky is proving up in a very satisfactory manner indeed. We are using him in the drafting room and find that his preparatory work in that line was quite thorough and he became immediately valuable to us."
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During the past few months we have helped HUNDREDS of men find good positions with big manufacturers, architects,

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**IMPROVE TONE AND
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**MODERNIZE OLD SETS
WITH ONE DIAL CONTROL**



**REDUCE
STATIC BY
MARVELOUS
NEW METHOD**



**RADIO-FY & ELECTRIFY
PHONOGRAPHS**



5 Easy Ways to Make \$3.00 an hour in Your Spare Time in RADIO

Each of these plans, developed by the Radio Training Association of America, is a big money-maker. Set owners everywhere want to get rid of static, to have their sets operate from the electric light socket, the tone improved, and the volume increased, and transformed into single-dial controls. Phonograph owners want their machines electrified and radiofied. If you learn to render these services, you can easily make \$3.00 an hour for your spare time, to say nothing of the money you can make installing, servicing, repairing, building radio sets, and selling supplies.

Over \$600,000,000 is being spent yearly for sets, supplies, service. You can get your share of this business and, at the same time, fit yourself for the big-pay opportunities in Radio by joining the Association.

Join the Radio Training Association of America

A membership in the Association offers you the easiest way into Radio. It will enable you to earn \$3.00 an hour upwards in your spare time—train you to install, repair and build all kinds of sets—start you in business without capital or finance an invention—train you for the \$3,000 to \$10,000 big-pay radio positions—help secure a better position at bigger pay for you. A

membership need not cost you a cent

The Association will give you a comprehensive, practical, and theoretical training and the benefit of its Employment Service. You earn while you learn. Our cooperative plan will make it possible for you to establish a radio store. You have the privilege of buying radio supplies at wholesale from the very first.

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Claude DeGrave, Canada: "I knew nothing about Radio when I joined a year ago. I am now a member of a very exclusive organization of Radio Engineers, and my income is 225% greater than it was."

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Radio Training Association of America
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ACT NOW—If You Wish the No-Cost Membership Plan

To a limited number of ambitious men, we will give Special Memberships that may not—need not—cost you a cent. To secure one, write today. We will send you details and also our handbook filled with dollars-and-cents radio ideas. It will open your eyes to the money-making possibilities of Radio.

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How Strong Are You?

Can You Do These Things?

Lift 200 lbs. or more overhead with one arm; bend and break a horseshoe; tear two decks of playing cards; bend spikes; chin yourself with one hand.

CAN you do any of them? I can and many of my pupils can. It is remarkable the things a man really can do if he will make up his mind to be strong. It is natural for the human body to be strong. It is unnatural to be weak. I have taken men who were ridiculed because of their frail make-up and developed them into the strongest men of their locality.

I Want You for 90 Days

These are the days that call for speed. It once took four weeks to cross the ocean—now it takes less than one. In olden days it took years to develop a strong, healthy body. I can completely transform you in 90 days. Yes, make a complete change in your entire physical make-up. In 30 days I guarantee to increase your biceps one full inch. I also guarantee to increase your chest two inches. But I don't quit there. I don't stop till you are a finished athlete—a real strong man. I will broaden your shoulders, deepen your chest, strengthen your neck. I will give you the arms and legs of a Hercules. I will put an armor plate of muscle over your entire body. But with it come the strong, powerful lungs which enrich the blood, putting new life into your entire being. You will be bubbling over with strength, pep and vitality.

A Doctor Who Takes His Own Medicine

Many say that any form of exercise is good, but this is not true. I have seen men working in the factories and mills who literally killed themselves with exercise. They ruined their hearts or other vital organs, ruptured themselves or killed off what little vitality they possessed.

I was a frail weakling myself in search of health and strength. I spent years in study and research, analyzing my own defects to find what I needed. After many tests and experiments, I discovered a secret of progressive exercising. I increased my own arms over six and a half inches, my neck three inches and other parts of my body in proportion. I decided to become a public benefactor and impart this knowledge to others. Physicians and the highest authorities on physical culture have tested my system and pronounced it to be the surest means of acquiring perfect manhood. Do you crave a strong, well-proportioned body and the abundance of health that goes with it? Are you true to yourself? If so, spend a pleasant half hour in learning how to attain it. The knowledge is yours for the asking.



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Author of "Science of Wrestling," "Muscle Building," "Secrets of Strength," "Here's Health," "Endurance," Etc.

Send for My New
64 Page Book

"Muscular Development"

IT'S FREE

It contains forty-eight full-page photographs of myself and some of the many prize-winning pupils I have trained. Some of these came to me as pitiful weaklings, imploring me to help them. Look them over now and you will marvel at their present physiques. This book will prove an impetus and a real inspiration to you. It will thrill you through and through. This will not obligate you at all, but, for the sake of your future health and happiness, do not put it off. Send today—right now, before you turn this page.

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Dear Sir: Please send me, absolutely FREE and without obligation on my part whatever, a copy of your latest book, "Muscular Development."

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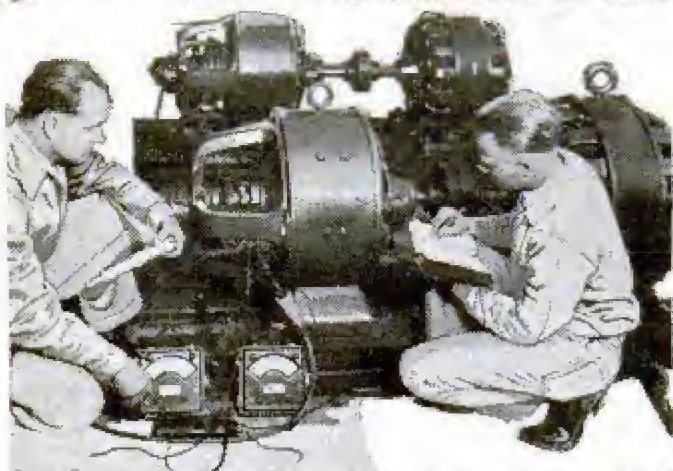
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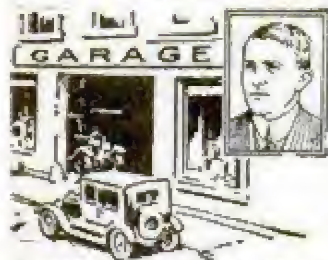
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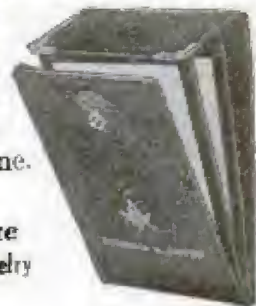
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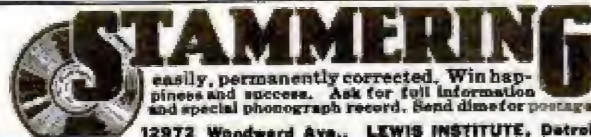
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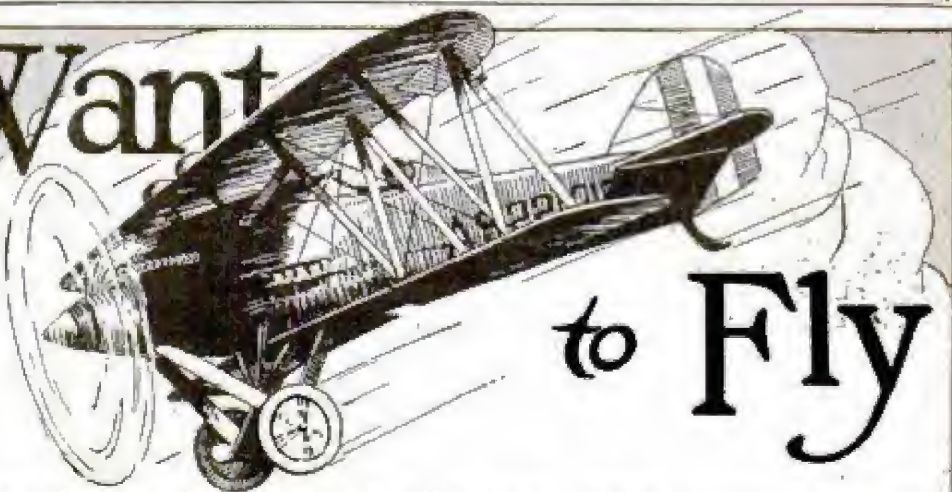
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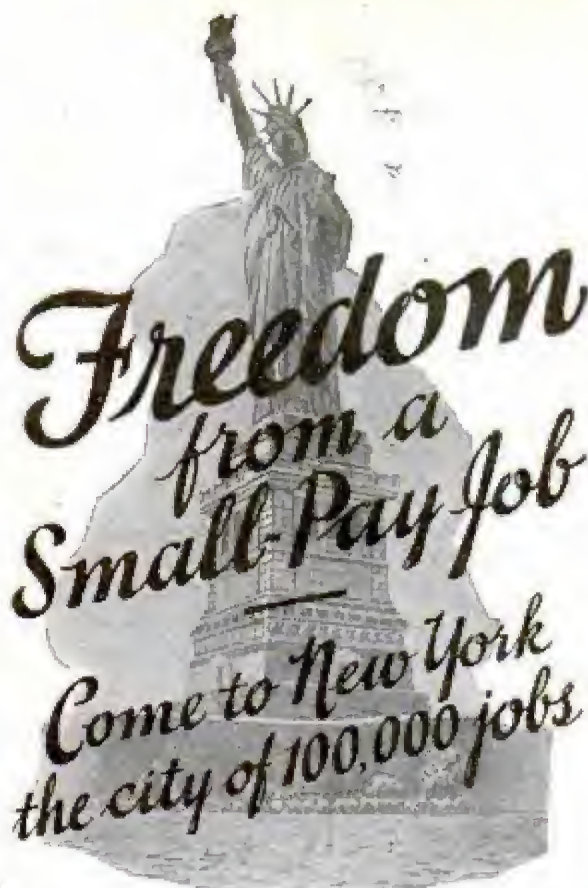
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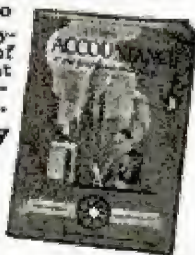
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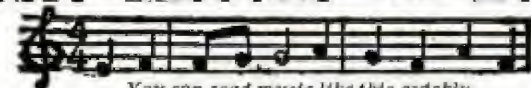


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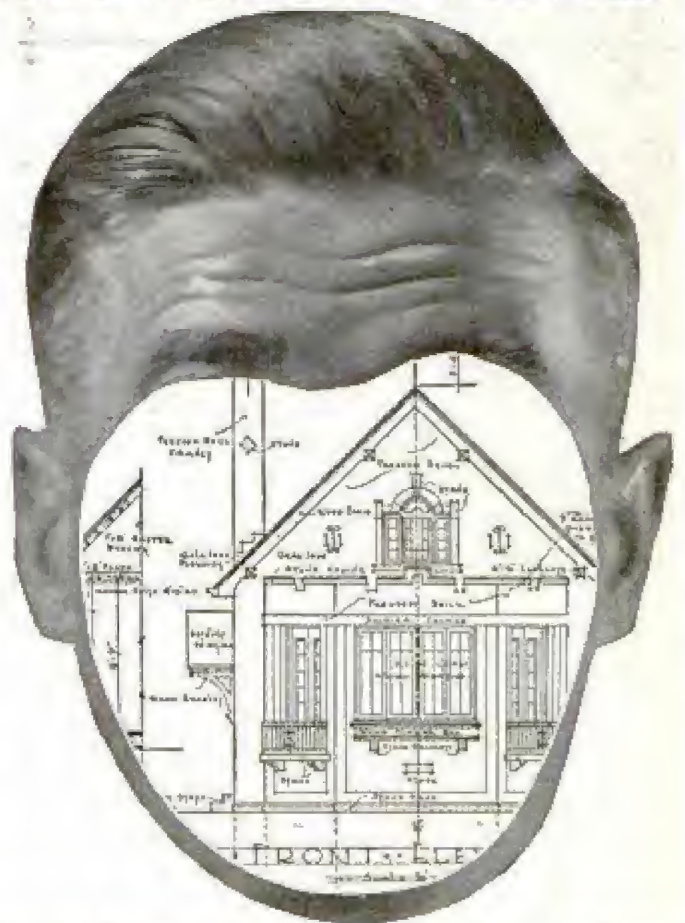
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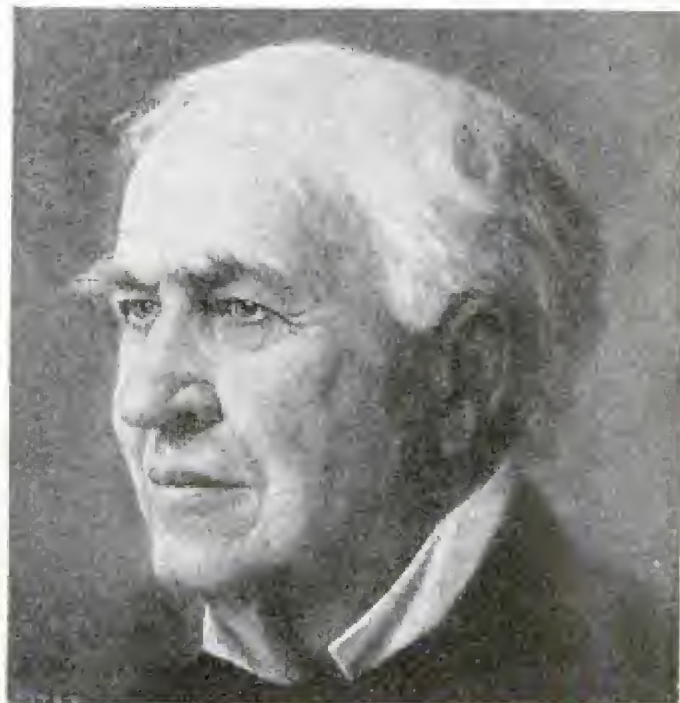
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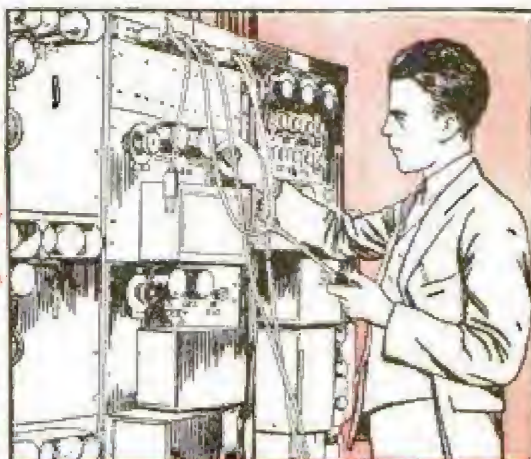
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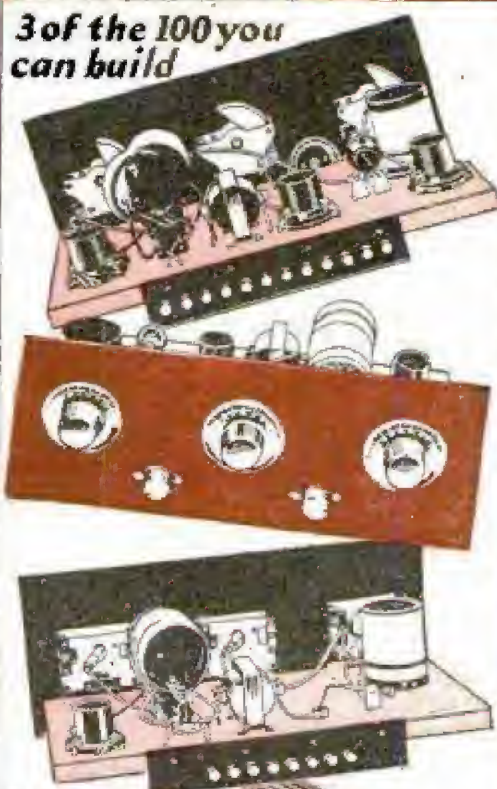
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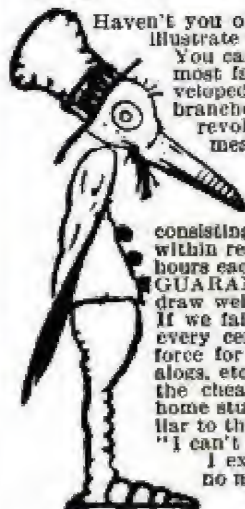
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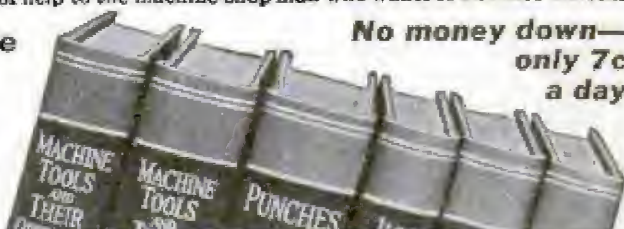
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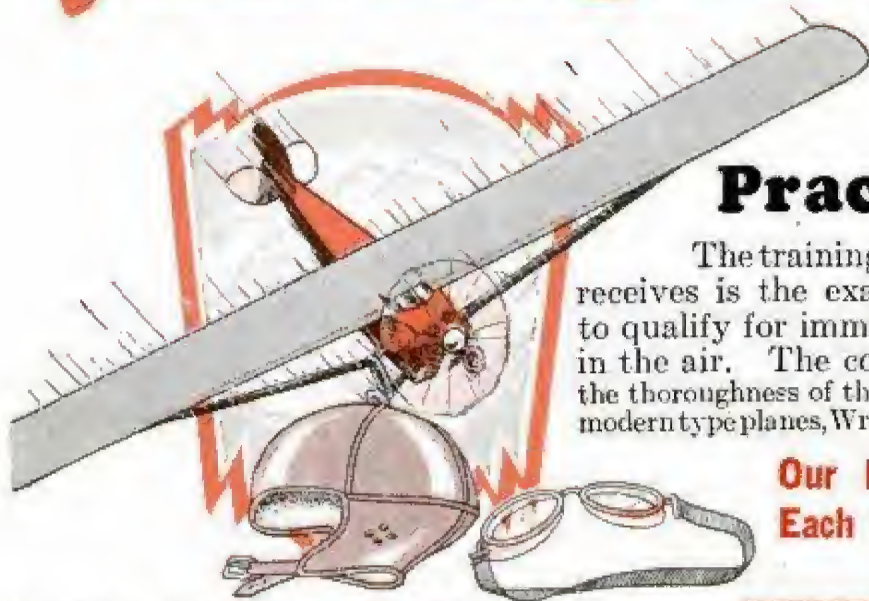
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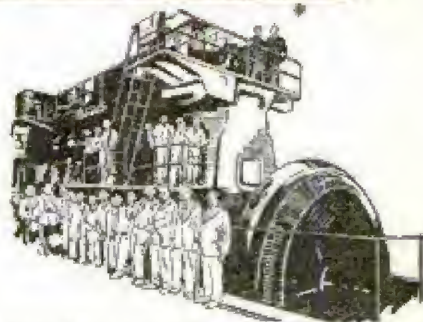
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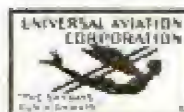
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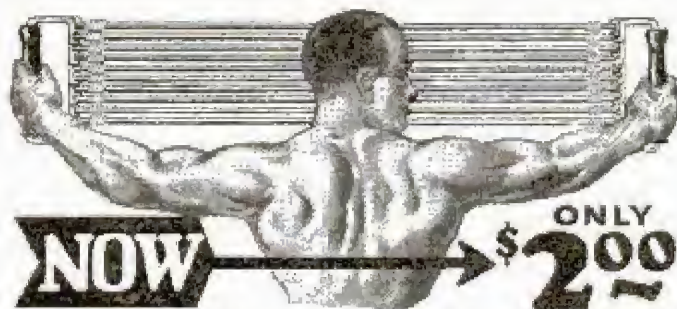
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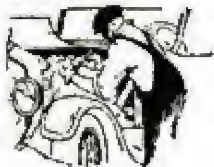
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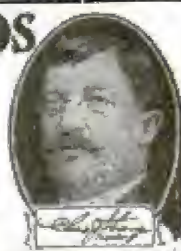
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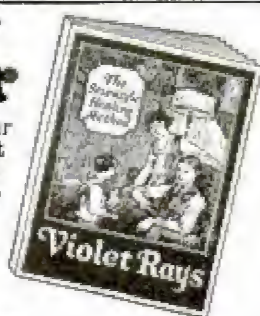
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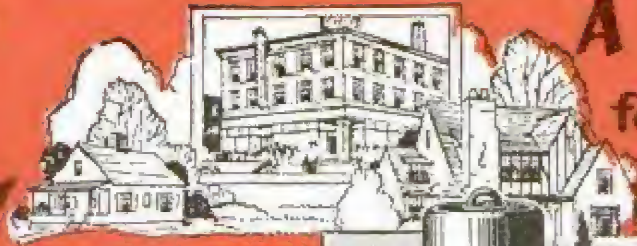
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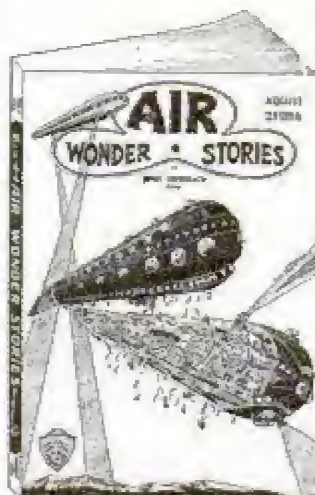
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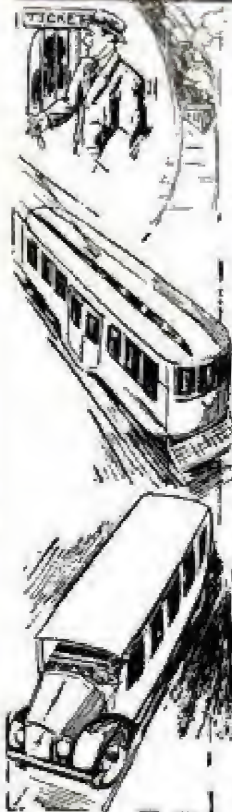
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NEW Invention lights gas without sparks. Free sample. Other necessities. Maywood, M-925, Broadway, New York.

\$100 WEEKLY Selling locally and by mail stainless tablecloth. Looks like linen, no laundering. Literature furnished your name. Free samples. Dancrafts Co., Los Angeles, Calif.

DISTRICT Managers! Crew managers! General agents! Wanted: Men and women to appoint saleswomen to sell "New Idea" imported sanitary necessity. New feature never before used. Every woman buys and repeats. New sales plan nets you big profit on sub-agents. Exclusive territory to producers. Write, Box J-708, Meriden, Conn.

THAXLY Formulas produce perfect products. All lines. Catalog free. B. Thaxly Co., Washington, D. C.

JUST Out: Drew's steam pad, a simple device for steaming the beard before shaving. Hospitals, barber shops, beauty parlors buy them wholesale. Every man you meet a possible customer. Write quick. W. L. Drew & Co., Puente, Calif.

JUST Out—New kind of electric lamp. 101 lamps in one. So beautiful women can't resist. So useful men buy instantly. Wonderful spare or full time proposition. Sell C. O. D. or deliver as you sell. Big profits daily. Write for money-making plan. Falcon Mfg. Co., Dept. L-91, 2550 Sullivan, St. Louis, Mo.

FREE Booklet describes 67 plans for making \$20-\$100 weekly in home or office business of your own. Elite Co., 84 Elizabeth St., New York.

HOME Economy oil gas burners for stove or furnace \$20.00. Agents wanted. M. E. Page Sales Co., Watkins Glen, N. Y.

A REAL Money-maker. Our Christmas box assortment makes real money for live men and women agents. 21 superb Christmas cards and folders. Biggest value ever offered. Ribbioned, parchment folders. Flor-entine, water color, engraved, embossed designs. All in beautiful Christmas box. Actual value \$2.80. Sells for \$1.00. Costs you 50c. Get in on this quick—Today! Free samples and particulars. Waltham Art Publishers (established 30 years), Dept. 88, 7 Water St., Boston, Mass.

AGENTS Earn \$7 day. Sell guaranteed hosiery. Select line fastest selling, biggest money making style numbers. Can't be beat for beauty and quality. Guarantee bond protects customers. Earn silk hosiery for your own use through new plan. Write quick. Silknet Hosiery Co., Dept. 1031, Dayton, Ohio.

MAKE \$85 Weekly. Amazing one-year guarantee sells Roseliff shirts fast. 24 hour shipments. No substitutions. Big advance commissions. Customer gets free initials. Earn your own shirts. Get free outfit including ties. Write today. Dept. PM-9, Roseliff Shirts, 1237 Broadway, New York.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

\$50-200 A WEEK. Genuine gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

BIG Money applying gold initials on automobiles. Easiest thing today. No experience needed. \$1.45 profit every \$1.50 job. Free samples. "Raleco," A1043 Washington, Boston, Mass.

MAKE \$95 Weekly; sell Broadway tailored shirt and new Rayon lined ties. Big commissions in advance. Quick sellers. Steady repeats. Guaranteed satisfaction. Free outfit. Write today. Dept. PM9, Big Bob, 489 Broome St., New York.

EARN Big money. representing established shoe manufacturer. No experience necessary. Big catalog and information sent free. Address Consolidated Shoe System, Dept. 68, Eau Claire, Wis.

BECOME Your home town leading business man. Sell full line of groceries, motor oils, paints. Everybody a customer. No capital or experience necessary. Selling outfit free. Write Lovern & Browne, 1602J So. State, Chicago.

SELLING Like blazes! Beautiful toilet goods assortment at \$1.50, with 24-inch pearl necklace free to your customers. 100% profit. E. M. Davis, 234 North Ave., Dept. 550, Chicago.

\$5.00 DAILY. Mercerized damask scalloped table cloths. Size 58x58". 75c! Tremendous demand. Other bargains. Big sample line free. American Brading, C-329 W. Monroe, Chicago.

\$20.00 DAILY. Latest trench coats \$2.98. All colors. Also Dupont's tablecloths \$1.30. 74 other big money makers. Samples free. American, 724-LD Roosevelt, Chicago.

RESTRICTED Territory for new 25c household necessity. Repeats every four months. Every home will use \$3.00 worth. If looking for real money maker write for free sample. Zero-B, 129 No. Halsted, Chicago.

YOU Can make big money in the food business. No capital or experience needed, credit given. Here is your chance to establish a permanent business of your own in exclusive territory. We furnish free sample case and free samples for customers. Repeat orders every week. Ask now! Federal Pure Food Co., A2307 Archer, Chicago.

FIBRE Brooms for home and industrial trade. Repeat business. Good profits. Perfect, 147C New Jersey Ave., Brooklyn, N. Y.

YOU Can make big money daily, selling Public Service ties and shirts styled on Fifth Ave. Largest assortment in the field. Splendid values, liberal commissions. Finest complete sales outfit free. Write today. Public Service Mills, 4939CF Hudson Boulevard, North Bergen, N. J.

SUCCEED With your own products. Make them yourself. Formulas, processes, trade-secrets. All lines. Catalog, circulars free. R. Tharby Co., Washington, D. C.

AGENTS Calling on garages to handle Riter Automatic Valve Grinders—side line. Weight 18 oz. Riter Co., 840 E. 5th, Los Angeles, Calif.

SELL Quick Trick automobile polishing cloths at 50c. 100% profit. Removes traffic grime from Duco and lacquer finishes. Fast seller. Everyone a prospect. Walter S. Doe & Co., Kent, Ohio.

GOLD-LEAF Sign Letters; copyrighted manufacturing instructions; profits 1,000%. Johnston Co., Quincy, Ill.

CARTER Window washer. Cleans, dries, polishes, one operation. 10 sales daily nets you \$120.00 monthly. Good territories open. Write today. Carter Products Corp., 981½ Front St., Cleveland, Ohio.

MAKE \$50.00, \$100.00, Schwer's popular box 22 Christmas cards. And other original novelties. Altogether different. No investment. Write Charley Schwer, Dept. PM8, Westfield, Mass.

TIME Counts in applying for patents. See pages 138 and 139. Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

CASH Paid for Butterflies, Insects. See Sinclair Display Advertisement on page 18.

AGENTS—Make a dollar an hour. Sell new kind of sharpeners. Sharpens all knives and tools quickly. Demonstrating sample 10c. Premier Mfg. Co., Dept. 95, Detroit, Mich.

MAN Or woman wanted with ambition and industry. To introduce and supply the demand for Rawleigh's Household Products to steady users. Place openings near you. We train and help you. Rawleigh dealers can make up to \$100 a week or more. No experience necessary. Pleasant, profitable dignified work. Write today. W. T. Rawleigh Co., Dept. 1-53PPM, Freeport, Ill.

\$50 WEEKLY. Men wanted to demonstrate and take orders daily direct from motorists. Amazing magnetic trouble light. Sticks anywhere! More orders, bigger pay. Write for demonstrator and particulars. Migno, Beacon Bldg., Dept. 18-C, Boston, Mass.

JUST Out—New patented apron. No strings or straps—\$20.00 a day every day; over 100% profit; commissions daily. Write for free outfit. Sta-Put Co., Dept. 200, St. Louis, Mo.

AGENTS: Free catalog 200 household specialties, toilet preparations, food products, portraits, frames, photo pillows, medallions, religious goods, pictures. Credit. James C. Bailey Co., Station C-9, Chicago.

SALESMEN—Earn \$100 weekly taking orders for Dazzler and Rainbow glow electric signs. Big commission. Exclusive territory. High grade proposition. Write Chicago Sign Sales Co., Dept. 80, Charlotte, N. C.

SNAPPY Shirt line ready! Season's best values. Agents cash in big. Nothing to invest. Get free outfit and handsome samples. Special features. Graceitt, Dept. 511, 504 Sixth Ave., New York.

SELL Razor blades; large profits; samples 15c. Information for startup. Kramer, 161 St. Paul's Ave., Jersey City, N. J.

MERCHANTS Buy on sight. Fast selling sales cards of razor blades (Gillette type). Also flints and wicks for cigar lighters. Samples free. Metro Specialty Co., 43 West Sixth St., Cincinnati, Ohio.

SOLE RENU. Aliquid leather completely resoles for few cents; spreads over sole; dries over night; wears like leather; sample can 50c. A. Wright, 3705 Fifth Ave., Pittsburgh, Pa.

YOU Get quick, sure, steady income, easy, from commissions selling our line advertising pencils. Surprisingly profitable, spare time or full time. Particulars free. Advertising Pencil Company, Walbrook M, Baltimore, Md.

\$75.00 WEEKLY Placing Genuine Gold Leaf Signs. Experience unnecessary. Demand unlimited. Best agency offer. Prominer Company, 179 N. Wells, Chicago.

START Fords new way. Chevrolets, too, with clever E-Z Finger Dash Control starter. Needed by millions everywhere. Sells on sight. Up to 150% profits daily. The year 'round. Get details and plan free. Metalcraft Corporation, Dept. L-10, 5101 Penrose Ave., St. Louis, Mo.

MAKE \$100 Week placing electric advertising cigar lighters and fans on dealer's counter. Flashing colored advertisements. Write Drake Mfg. Company, Dept. M, Milwaukee, Wis.

AGENTS: 100% Profit. Sell Wipe-a-shine Auto Towels. Cleans and polishes auto finish with one application. Nothing to break, nothing to shake. Lasts indefinitely. Sells for \$1.00. Send 50c deposit for full size sample. Money refunded on first order. Zenith Chemical Works, 5526 W. Lake St., Chicago.

\$85 WEEKLY Selling nationally advertised dresses, lingerie, hosiery, amazing values. Complete equipment and earn your own clothing. Sure profit plans furnished. Shaughnessy Knitting Co., 348 Shaughnessy St., Watertown, N. Y.

AMERICA'S Greatest tailoring line—Free. 150 large samples. All wool—tailored to order—union made—sensational low price. Big commissions paid daily. Cash bonus besides. Exclusive territory to producers. Hustlers making \$100 a week and up. Get outfit at once. Address Dept. 203, Goodwear, 814 Adams, Chicago.

STRANGE New electric iron cord! Prevents scorching. Saves electricity. Cannot kink or snarl. Used on telephones also. \$25 daily. Samples free. Neverknot, Dept. 9-A, 4503 Ravenswood, Chicago.

2 NEW Patent auto accessories, exclusive territory, no competition. Wholesale and retail sales. Satisfaction guaranteed. Samples 50c. Desk 3, Ball Manufacturing, 941 Pleasant, Chicago.

WELLS Cleared \$620.00 in one month with Business Guide and free legal service. Write for free outfit. Prof. Nichols, Dept. 58, Naperville, Ill.

HOMEOPATHIC And Biochemic preparations sent postpaid to all parts of the world. Manual and booklet free. Halsey Bros. Co., 5547 Ravenswood Ave., Chicago, Ill. Established 1855. Agents wanted.

BIG Ohio corporation wants county manager. Opportunity \$50 to \$75 weekly. Earnings start immediately. Good for \$5,000 yearly. We furnish everything, deliver and collect. Capital or experience unnecessary. Fyr-Fyter Co., 1906 Fyr-Fyter Bldg., Dayton, Ohio.

AGENTS—Earn \$19 daily demonstrating and wearing fine felt hats and showing them to friends. Smartest styles. Latest shades. \$2 to \$5 saving on every hat. Samples free. Write Taylor Hats, Dept. MC-135, Cincinnati, Ohio.

Where To buy 500,000 articles at lowest wholesale prices. 1929 Directory. Distributors wanted. Pruitt System, Brookfield, Ill.

AGENTS—Make big profits selling gas or oil wash furnaces. Profits each sale \$3.00 to \$5.00. Every home a prospect. Adams Manufacturing Company, Dept. A, Commerce, Tex.

BRANDNEW 50c Specialty. 150% profit. Quick demonstration sells every housewife. Pocket sample. Deliver on spot. Great side line. Agents, distributors cleaning up \$45 to \$124 weekly. Territory going fast. Write today sure. Harker Co., Battlecreek, Mich.

AGENTS—Absolutely new! Our hand-colored popular priced photo statuettes going big! Everyone wants them! Agents making \$10-\$25 daily! Samples furnished. Cruter Mfg. Co., J82456 Jackson, Chicago.

HOSIERY Agents—Take orders for startling new hose. Absolutely no competition. Not sold through stores. Every woman buys. Big repeater. Outfit free! Racine Feet Knitting Co., Dept. 20-9, Beloit, Wis.

AGENTS. Clean up selling well-known Cee-dar Crystals for 35c. Paddle that hangs on hook 25c. Box DeLuxe 50c. Kills moths, deodorizes. Free particulars. Cee-Dar, H77 W. Washington, Chicago.

AGENTS—Write for free sample Dril-Klean-It. Makes your car look like new. Removes mud, dirt, dust. No soap or water used. American Accessories Co., Desk 5431, Cincinnati, Ohio.

\$2.45—RAINCOATS. All colors. Trench coats, tweeds, alligators, leatherettes. Sample coat and bonus to workers. Beautiful outfit free. Bradley, Dept. AB-9, 230 S. Wells, Chicago.

AGENTS. Give customer two pounds toilet soap free with \$1 bottle superior vanilla. 100% profit. Midwest Drug Company, Dept. B-9, Columbus, Ohio.

AGENTS. Distributors making big money with fast selling 50c specialty. Repeater. Ask how we guarantee sales. M. & M. Company, Box 34, Attica, Ind.

AGENTS Big money. Bonus besides. Sell best line guaranteed hosiery. All styles. Big profits. Credit given. Spare time satisfactory. Write for sales plan. Auto to producers when earned. Betterknit Hosiery Co., Silk 5031, Columbus, Ohio.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

AGENTS—New style tablecloth. No laundering; hemstitched, flannel back; several colors. Sells itself. Samples free. Puritan Mills, 43 Tremont St., Boston, Mass.

LET Me add \$30 a week to your pay without interfering with your present occupation. Interesting, pleasant work. Particulars free. Albert Mills, 3778 Monmouth, Cincinnati, Ohio.

MANUFACTURER Of Guaranteed Shoes. 25 years in business. Offers big, money-making opportunity. New 96-page catalog, sales manual and complete details of proposition sent free. Write Mason Shoe Mfg. Co., Dept. H-17, Chippewa Falls, Wis.

MIRRORS Resilvered at home. Costs near 5 cents per square foot; you charge 75 cents. Immense profits plating autoparts, reflectors, tableware, stores, refinishing metalware, etc. Outfits furnished. Details free. Write Sprinkle, Plater, 128, Marion, Ind.

AGENTS. Housewives everywhere buy our dollar ironing board cover and unburnable pad. Tremendous demand. High commissions assure unlimited earnings. Full-spate time. Murdo Co., 105 Wooster St., Dept. B9, New York.

LARGEST Money maker tailoring line pays \$4.00 to \$7.00 order. Cash bonuses. Free suits to producers. All wool serges, cassimeres, top coats. Quality worsteds, heavy weight overcoats. Giant outfit, 1/4 yd. samples free. Dept. PM9, Olympic, 5th Ave., at 19th St., New York.

SELL Personal Christmas cards, names embossed in gold, \$1 dozen up. 50% commission. Samples free. Also box assortments. Dunbar Corp., New Brunswick, N. J.

BIG Money selling shirts and ties! Wonderful values. Finest line now ready. 54 latest New York styles. Big outfit and special samples. Everything free. Pioneer Mills, 1225 Broadway, Dept. B18, New York.

SELL "Prevents Runs." Guaranteed to prevent runs in silk hosiery. Large profits. Particulars, Specialty Mfg., 307 West First, Los Angeles, Calif.

BIG Money weekly. Newest window letters out. Easiest to put on. No experience needed. Free samples. "Raleco," 1045 Washington, Boston, Mass.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

MEN! Get the new sensational Gitsknife counterdagger. Good for \$20.00 daily. Free offer! Gits Co., D5419 Chicago Ave., Chicago.

BIG Money daily, selling shirts of all kinds, lumberjackets, underwear, hosiery, sweaters, playsuits, overalls, pants, raincoats, leather coats! Outfit free! Experience unnecessary. Nimrod Co., Dept. 8, 4922-28 Lincoln Ave., Chicago.

NO Matter what you are selling postal addressed to Excelsa Sales Co., Shreveport, La., will bring best money making offer you ever received.

"THE Ringside," patented wind-operated boxing match. "A Million Rounds For One Dollar." Six dollars per dozen. Sample 60c postpaid. Weatherwise Toys, Georgetown, Mass.

MYSTERY Polishing cloth in tin cans sell like hot cakes. Write free sample. Mohler, Box 453DZ, Chicago.

SELLING Like sixty. New product kills mths, flies, mosquitoes and other insects. Immense profits. Dakrymple Co., U-294, Benton Harbor, Mich.

WRITE Atlas Sign Works for free working equipment. Beautiful gold window sign letters. Penny each! Any size. Wonderful offer to general agents. K1032 E. 55th St., Chicago, Ill.

PERFUMES. On counter display cards. High quality. Low prices. Large profits. Helen of Troy, 58 West 93rd St., New York.

MAKE \$20 To \$35 a day selling Imprint Book Matches, spare or full time. Big repeat business—no investment—every merchant a prospect. Send 50c for selling outfit which includes complete samples. Imprint Book Match, Dept. 110, 877 Meigs St., Rochester, N. Y.

OVER 200 Reliable manufacturers need agents in every locality in the United States. Learn all about it in the current issue of Opportunity Magazine. Free sample copy sent on request. Opportunity Magazine, Dept. M39, 750 N. Michigan, Chicago.

\$15.00 DAILY Selling new tablecloth. Requires no laundering. Tyrrell Company, Martins Ferry, Ohio.

AGENTS—New shirt proposition. No capital or experience needed. Commissions in advance. Samples free. Madison Company, 568 Broadway, New York.

ARE You old at forty? See our advertisement on page 153 of this issue. The Electro Thermal Company, 2120 Morris Ave., Steubenville, Ohio.

LATEST Craze! Show new kitchenware in 5 appealing colors to housewives. Kitchen necessities. \$90 weekly easy. Big repeat sellers. No experience or cash needed. Beautiful colorful selling outfit free. See page 157 this magazine. Full particulars. Modern Kitchenware, Dept. 6-MM, 176 W. Adams, Chicago.

AGENTS. Opportunity seekers. Make amazing profits. Write Empire, Shawano, Wis.

RIM Tool—Complete tire change 24 seconds. Exclusive territory. Victory Tire Rim Tool Co., Santa Monica, Calif. 1516 Pico Blvd.

BUILD Profitable business of your own. distributing samples. Write for particulars and samples. Rudman, 1751 Anthony Ave., New York City.

\$12.00 DAILY Showing new table cloth. Looks like linen. Wash like oilcloth. No laundering. You just take orders. We deliver. Pay daily. Sample free. Bestever, 152 Irving Park Station, Chicago.

LADY Or gentleman—Sell sparkling glass name plates, house numbers, signs, 150% profit. Sample free. O. Vance, Wooster, Ohio.

LOCAL Representatives for Duplex Adjustable Sash Balance make big money. Sells on sight. Duplex Manufacturing Co., 632 N. La Brea, Los Angeles, Calif.

\$75 WEEKLY Up placing Aspirin, Notarar, Lighter Flints, Silk-Tone and other self-selling counter display cards with merchants, soda fountains, cigar stores, etc. Over 100% profit. Steady repeats. Sterling Company, F. Baltimore, Md.

AMAZING Discovery triples life of silk hosiery. Every woman a prospect. Enormous profits; quick repeater. Eston, Box 683, Birmingham, Ala.

A BUSINESS Of your own—Making sparkling glass name and number plates, check-boards signs. Big book and sample free. E. Palmer, 512, Wooster, Ohio.

AGENTS Wanted—On a fast selling 25c item for the kitchen, costs you 8 1/2c. Sample sent parcel post prepaid for 10 cents. P. Seed Filter Mfg. Co., Inc., 353 Broadway, New York.

MEN With autos sell Koehler signs. 717 North Fourth, St. Louis, Mo.

SELL Goodyear raincoats; \$2.95 up. Goodyear Rainwear, 346 Sixth Ave., New York.

AUTOMOBILE Specialties. Guaranteed formulas for all latest money makers. Lowest prices. Write for free list. Murphy, Chemist, Tujunga, Calif.

AUTO Mitten Duster. Season's biggest selling hit. Cost 20c. Sells like hot cakes for 50c. Sample given. National Brushes, St. Louis, Mo.

PORTRAIT Men: Why not Pasco portraits? We refund your money for all you cannot deliver. Frame, catalog free. Portrait Agent's Supply Co., Dept. F, LaPorte, Ind.

AGENTS—Mosco Corn and Callous Remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Moss Company, 435 Searle Bldg., Rochester, N. Y.

FLAVORING Extracts—Bottle yourself! Concentrated. Free labels. 600% profits! WhiteWind money-making proposition! Write Thomas Manufacturing Company, Indianapolis, Ind.

100% CLEAR Profit! Men and women! Enormous profits can be made selling new \$2.00 patented Pinless Curtain Stretcher. Miniature demonstrator furnished. Article sells itself. Exclusive territories available to first applicants. Western Nowell Mfg. Co., Freeport, Ill.

NEW Style needle books pay \$22.00 daily profit. Free clever threader invention to customers creates eager buyers. Sweeping country. One billion Paty needles sold. Proof free. Sample 10c. Paty Needle Co., West Somerville, Mass.

\$200 MONTHLY Selling amazing new automobile trouble light. Sticks anywhere on car. Electro magnetic. It's also an everlasting flashlight. Send for demonstrator and prices. National Electric Corporation, 222 High St., Newark, N. J.

OUR Special plan makes sales easy! Make us prove it! Guaranteed products. Details, samples free! Write today! Togstad Co., 30 Union St., Kokomo, Ind.

400% PROFIT Selling imported and American novelties A \$5.00 investment will earn \$160.00. Valuable and useful samples—complete information 25c. Northwestern Novelty Co., 543M No. Ashland, Chicago.

\$5 SALE—\$5 Commission. Combination life-accident policy. Address Underwriters, PM-5, Willow Hill, Ill.

MAN In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Decatur, Ill.

REPLATE Brass worn-off automobile parts, reflectors, bath room fixtures, worn spoons, forks, etc., with pure silver. Looks like new. Use U-Kan-Plate Polish. Absolutely no mercury. \$1.00 half pints. Post paid. Satisfaction guaranteed. Agents wanted. Dept. A, U-Kan-Plate Co., Philadelphia.

AGENTS—Clever Invention! Inkspoon makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marul Company, Tribune Bldg., New York, N. Y.

TWO Money makers for agents. "Francia" Pocket Adding Machine retails \$4.85. To you \$1.00. "Execubograph" Rotary Stencil Duplicator \$37.50 retail. Write Typewriter Supply, 102 Hersch Bldg., Pittsburgh, Pa.

WE Start you without a dollar. Soaps, extracts, perfumes, toilet goods. Experience unnecessary. Carnation Co., 641, St. Louis, Mo.

BIG Profits! Fast sales! \$9.75 automatic washing machine. Guaranteed. Write Storm Royalty Co., 3601 Enright, St. Louis, Mo.

CALIFORNIA Perfumed beads selling like hot cakes. Agents coinng money. Big profits. Catalog free. Mission Factory P, 2328 W. Pico, Los Angeles, Calif.

SELL Supreme No-Cement tire and tube patches. 300% profit. Particulars. Supreme, 135 Winder, Detroit, Mich.

\$50,000 PICTURE Man Friedman made canvassing. Beginners can make \$100.00 weekly with my sales talk. Experienced men make more. Free book "Profits in Portraits" explains. Sample free. Picture Man Friedman, Dept. 8, 109 West Austin, Chicago.

BIG Money and Fast Sales. Every owner buys Gold Initials for his auto. You charge \$1.50; make \$1.34. Ten orders daily easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

SELL Stores 5c carded Breathlets, mints, etc. Lorraine Products, Albany, N. Y.

SHOE Creme, cleans, polishes all color shoes. Fred Heilmueller, 830-A Cherry, Jamestown, N. Y.

AGENTS. "Strike a gold mine" when selling Nulustre cloths at 25c; cleans, polishes all metals; the duller the metal, brighter it shines. Everybody delighted. Agent sells 102 boxes in 116 calls. Write for free samples, proof. Shef Mfg. Co., 1 Shef Bldg., Waukegan, N. J.

AGENTS—Make large profits handling our hand engraved name plates, signs, numbers, etc. Brett Bros., Winthrop, Mass.

AGENTS—Here's a new one. "Bestever Powdered Hand Soap." Sells like wildfire. Marvelous discovery. Removes grease, paint, ink, oil, in fact anything from hands. Cannot harm skin. 150% profit. Great repeater. Agents simply coin money. "Free Samples Get the Business." Write immediately. Bestever Products Co., 4315W Irving Park, Chicago.

POLMET Polishing Cloth removes tarnish from metals without the use of liquid, paste or powder. Our agents say it sells like "hot cakes." Retail 25c; sample free. Gale & Co., Inc., 15 Edinboro St., Boston, Mass.

32 SECONDS Complete tire change by Detmer, Ohio, with Morey Quick Action Rim Tool. Sold, singly, 49 three days cleared \$100. Anderson, Mont., sold 1,400 in 14 weeks. Get details for good territory. Harvest time now. M. Morey Rim Tool, Buffalo, N. Y.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

AGENTS. Our cigar lighters, musical novelties and salesboards sell quick. Large wholesale catalog free. Joseph Sales Company, 223 Madison St., Chicago.

GENUINE Gold Leaf Letters anyone can put on store windows. Guaranteed to never tarnish. Large profits. Enormous demand. Free samples. Write today. Metallic Letter Co., 438-D North Clark, Chicago.

MANUFACTURE Auto Specialties: Radiator Seal, Hand Soap, Puncture Plugger, Silk Life, Glass Cleaner. Get my free list. John Mickman, Chemist, St. Paul, Minn.

SELL Men's neckwear—wonderful proposition. Astor-M, 39 East 28th, New York.

REMNANT Store, Bethel, Ohio. Greatest Dry Goods Bargains on Earth. Agents and Dealers.

MONOGRAM Automobiles. \$1.35 Profit ten minutes' work; every owner wants them; millions without; particulars free. Motorists Accessories Co., Mansfield, Ohio.

GOLD-LEAF Window letters and script signs; no experience; 500% profit; samples free. Consolidated, 69-T West Van Buren, Chicago.

GET Our free sample case—Toilet articles, flavoring and specialties. Wonderfully profitable. LaDerma Co., Dept. A, St. Louis, Mo.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name and address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., Desk 2, 393 Degraw St., Brooklyn, N. Y.

WORKERS Buying and applying Artell Metal Weather Strips to door bottoms make \$1.00 to \$3.00 hourly. Prices, territory, etc. E. L. Church Co., Whitman, Mass.

HIGH-GRADE SALESMEN WANTED

PREVENT The accident. Sales experience unnecessary. We furnish you proven plan to make money. Sensational seller. Marvelous Auto Safety Signal. No longer necessary to rely on faulty misleading hand signals. Illuminated hands combined with stop and tail light tell in an unmistakable manner the driver's intention to turn right, left, stop or back-up. Reasonably priced. Highly endorsed. Every car and truck driver wants one. Write for literature. Convince yourself. Act quickly. Your territory fortune. Safety Signal, 501 Colorado Bldg., Denver, Colo.

AMAZING Pencil sells like magic. Combination cigar lighter and writing pencil for only \$1.00. You make big profits selling direct. Also sell to merchants—hand-some display card holding 12 Pencillites furnished. Can be sold as splendid advertising. Novelty for business firms; with names or trade marks imprinted. Write immediately for remarkable money-making proposition. The Lyco Co., 700-708 E. 40th St., Dept. H-92, Chicago.

FEW \$1,000 Monthly earnings ads are truthful. Our men actually earn \$300 to \$500 regularly selling our lines. Adelle, the newcomer in electric window salesmen, is making a big hit. More for the money than anybody gives. Business posters for every line. Changeable letter system too. Permanent business for you working with us. Territory protected and repeats credited. Fat commissions. Full details will prove very interesting. Display Products, Ltd., 409-A East 31st St., Kansas City, Mo.

CASH in on million dollars publicity campaign. No investment. In a week Diederichs earns \$78. Wilde \$91. Crile \$102. Hickson \$119. Pay check weekly. Take orders for our dependable trees, shrubbery, Landscape service. Every home a prospect. Work entire year, full or spare time. Complete cooperation. Inexperienced men trained. Write us today. Perry Nurseries, Desk R-9, Rochester, N. Y.

SALESMEN—Become independent. Own your business; experience unnecessary. Selling our \$10,000 Accidental Death; \$50 Accident; \$25 Sick Weekly Benefits—\$10.00 yearly. Other amounts proportionate. Guaranteed steady income from renewals. \$250,000 deposited Insurance Department. Universal Policy Dept. A, 40 Clinton St., Newark, N. J.

PAYING Position open. I'll put you in the shoe and hosiery business. Permanent income, protected territory, full commission on repeats. Experience not necessary. Handsome sample outfit, literature—everything you need to become a successful shoe merchant. Send for free booklet "Getting Ahead." Wm. J. Michel, Tanners Shoe Mfg. Co., M, 2009 C St., Boston, Mass.

\$40.00 SUITS For \$23.50! Union made to special order, of finest quality virgin wool. You don't have to know anything about selling clothing. We guarantee your success if you are honest and willing to work. Write at once. Goodwear, Inc., 844 West Adams, Dept. 204, Chicago.

EVERY Call a prospect. Every sale means big repeat business. Complete line—attractively packaged. Nationally used household chemical necessities, etc. Protected territory to producers. Big earnings. Opportunity to build up permanent business. The Holmerden Company, Stratford, Conn. Dept. P.

MAKE \$125.00 Weekly selling biggest tailoring values in America for \$24.75. Custom tailored to measure all virgin wool worsted suits—your profit \$4.00 in advance, plus bonus of 50c to \$2.50. Satisfaction guaranteed. Write immediately for free sample case. Camden Clothes, 317 S. Market, Dept. J-13, Chicago.

SALESMEN Calling on power users to sell belting as a side line; auto traveled territory preferred. Teuscher Pulley & Belting Co., 801 N. 2nd St., St. Louis, Mo.

WONDERFUL invention. Seals fifty envelopes minute. Sells on sight at \$3.50. Attractive proposition. Square deal. Bank references. Kendall Sealer Co., C-15, East Jaffrey, N. H.

COVERALL Salesmen—Make \$20 daily selling new \$3.50 improved coveralls, also service coats with customer's name embroidered on back. Unusual construction. Commission 75c! Wonderful advertising value. Lowest priced; highest commission. Free outfit. Am. B. Co., AU-329 W. Monroe, Chicago.

AUTO Seat cover line pays \$100 weekly. Sell direct to automobile owners. Low priced—excellent quality. Elaborate 4x7 samples free. Marvelo, 2302 Wabansia, Chicago.

WELL-KNOWN Mfg. needs sideline salesmen. Sell leather gladstone bags to stores. Retail under \$10.00. Liberal commission. Loma, 625 S. Racine, Chicago.

\$78.00 MADE By Iowa salesman first day selling new electric hot dog machines. Sells \$18.50; commission \$8.50. Direct factory connections. Leonard E. Dickerson, Dept. E-16, Springfield, Mo.

MEN of ability—To represent manufacturer direct selling superior line of advertising thermometers. All or part time. Liberal commissions. Marshall Mfg., Coshocton, Ohio.

SPLENDID Sideline. Excellent profits selling to trade, finest complete line vending machines, etc. No samples. Sell from catalog. Specialty Mfg. Co., W617 W. Division, Chicago.

EARN \$20 A Day. Establish income for life selling for \$1 a year, \$1,500 accident policy. Write W. C. Stone, 11 So. LaSalle, Chicago.

35% COMMISSION. Liberal repeats. New sales-producing service increases business 20% to 50%. Every retailer live prospect. Sales Stimulators, 339 W. Madison, Chicago.

SALESMEN! Sell Bostonian Shirts. Direct to wearer. Start in a money-making business of your own without a penny of capital. No experience necessary. Wonderful complete selling outfit free with everything you need to start collecting your profits at once. Write today, sure! Bostonian Mfg. Co., 106 Bickford St., Boston, Mass. Est. 1863.

A MONEY-MAKING Sideline. A new quick seller to merchants and banks everywhere. Sales outfit free. Comm. paid daily. Carroll Co., Carroll and Albany Aves., Dept. 204, Chicago.

AUTO Specialty men, high grade, as exclusive distributors in each city or county, to sell our patented rubber products. Pneumatic door cushion and universal pedal cushion to dealers. Write personally. Inventor Milbender, 1424 East 38th St., Los Angeles, Calif.

AMAZING Screw-holding screw driver! Factories, garages, workers buy on sight! Profit 75c each. Exclusive territory. Free trial offer. Jiffy, 1162 Winthrop Bldg., Boston.

100% PROFIT Demonstrating motorists magnetic emergency light. Sells on sight. Sticks anywhere on car. Quick-Set Co., 3218 Avenue Eye, Dept. C9, Brooklyn, N. Y.

NEW Discovery astounds America. Salesmen cleaning up \$75 to \$125 weekly. "Elastishine" destined to revolutionize automobile painting. Flows on like magic over old paint. Brush marks disappear instantly. Guaranteed not to chip, peel or crack. Free starting offer. Southern Products Co., Dept. 46, Hopkinsville, Ky.

SANTA Claus money—Amazing new low cost trade stimulator for retailers. Big commissions on new and repeat business. Moyer, 446 McKnight Bldg., Minneapolis, Minn.

STATE Mgr. Marvellous invention seals 3,000 envelopes hourly! Sells \$4.50 only; equals work expensive electric machines. Offices buy 1-100. Exclusive territory. Opportunity earn \$7,000 yearly. Free trial offer. Write quick! Rede, 35 Winthrop Bldg., Boston.

FREE Outfit—Trousers bonus. \$15.00 daily writing orders for guaranteed tailored-to-measure trousers. World's greatest pants value. Big commissions. Wonderful pocket sideline. Hutchins Pants Co., Dept. 363, Cincinnati, Ohio.

OUR Captive base ball, Eclipse wrapping bands and auto-light deflectors are a new and attractive sideline for reliable salesmen. Martin Mfg. Co., 1204 5th N. W., Canton, Ohio.

LUSTROUS Aluminum stove pipe. Beautiful, durable, inexpensive. Displaces black pipe on gas stoves and heaters. Every housewife a prospect. Hardware stores, furniture dealers also. Sold under money-back guarantee. McCarthy Mfg. Co., Pear Ave., Cleveland, Ohio.

WANTED District managers—Capable men to represent us in prosperous territories with direct home office contract. Our organization is the oldest of its kind in the health and accident business and offer exceptionally remunerative compensation. Write today for information. Dept. 18, Inter-State Business Men's Accident Association, Brown Bldg., Des Moines, Iowa.

BUSINESS Stationery—Largest line; highest quality; quickest delivery; biggest commissions; liberal bonuses. Free copyrighted cuts every business. Experience unnecessary. Instructions and outfit free. Willens Co., Dept. 245, 2130 Gladys Ave., Chicago.

GOLD-LEAF Window letters and script signs; no experience; 500% profit; samples free. Consolidated, 69-Y West Van Buren, Chicago.

PATENTED invention cuts gasoline bills in half. Proved by automotive engineers. Fast seller on simple demonstration. 2 sales daily pays \$60 week. Exclusive territory. Write for free trial offer. Aerostat Co., 3601H Villet St., Milwaukee, Wis.

BIG Money daily, selling shirts of all kinds, lumberjackets, underwear, hosiery, sweaters, play suits, overalls, pants, rain-coat outfit free! Experience unnecessary. Nisrod Co., Dept. 65, 4922-28 Lincoln Ave., Chicago.

ARE You old at forty? See our advertisement on page 153 of this issue. The Electric Thermal Company, 2120 Morris Ave., Steubenville, Ohio.

\$18 TO \$25 Daily; biggest selling line of 2-piece suits, \$9.95 and \$12.50; 3-piece wool suit, \$17.95 (regular \$28.00 value). All-wool overcoats \$18.50. Splendid raincoats, slickers and boys' suits. Biggest commission. Free outfits. "Jim" Foster, Inc., Dept. 29, 2250 S. Spaulding Ave., Chicago, Ill.

OVER 200 Reliable manufacturers need salesmen in every locality in the United States. Learn all about it in the current issue of Opportunity Magazine. Free sample copy sent on request. Opportunity Magazine, Dept. M49, 750 N. Michigan, Chicago.

SALESMEN: Make big money supplying business printing. Low prices sell merchants and professional men easily. 30% commissions daily. Profitable as side line. Write for sales portfolio. Mercantile Printing Bureau, 114 North Second, Rockford, Ill.

EXTRA Money—Easy! Sell Christmas cards! Make 50c on each \$1 box of 24 finest assorted engraved designs. 40% on personal greetings. Deal direct with manufacturers! Write for samples and details. Thistle Engraving & Pub. Co., Dept. P, 20 Vesey St., New York.

RIGHT Now! Wonderful chance to represent big shirt manufacturer. Best season coming. Easy work. Commission in advance. Outfit given free. Write Gravelly Company, Dept. 511A, 504 Sixth Ave., New York.

GALLOPING Ivories. New game that's thrilling all America. Absolutely legal. Every cigar counter waiting for you. \$125-\$200 weekly. Hurry K&S, 4308 Ravenswood, Chicago.

PUNCHBOARD Salesmen make \$200.00 weekly selling punchboards and vending machines. Big repeat commissions. Beautiful 3-color catalog free. Best season now. Write today. Old reliable company, established 20 years. Lincoln Sales, 118 S. Wells, Chicago, Dept. D.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1954W Broad, Richmond, Va.

ADVERTISING Pencils. Quick-action sideline money-maker. Free samples for real salesmen. Northern Pencil Works, 125 So. Clinton, Chicago.

SALESMEN. Wonderful sideline. 40% commission paid daily. Sells all merchants. Pocket outfit free. David Lionel Press, 312 S. Hamilton, Dept. 84, Chicago.

\$50-\$200 A WEEK. Genuine gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-A North Clark, Chicago.

SUCCESS is no accident! You will fully understand this slogan when you examine our automatic credit and collection plan. Copyrighted, brand new, unusual. You make 250% on original sale. Half cash on repeats without call-backs. Commonwealth J. Publishing Company, 508 So. Dearborn St., Chicago, Ill.

SALESMEN—Four \$15.00 sales to merchants net you \$40.00 daily. Sayers Systems, 2813 Sheffield, Chicago, Ill.

ALL Year round profitable business. Earn extra money spare time selling wonderful new water softener and cleanser. Cleans like magic, grease, ink and dirt from every thing. Every home and business place a live prospect. 100% profit. Big repeat orders. Agents protected. Trial case \$4.00 delivered U. S. A. Seacoast Laboratories, Inc., Sea Bright, N. J.

SELL Printing—40% commission daily; lowest prices; with or without deposit. Copy-right cuts free. Inquiry brings pocket outfit. Merchants Assn., Insurance Center Bldg., Chicago.

TO Market 3A garage door holders. Simple automatic action, quickly installed, instantly attracts garage owners, builders, dealers. Write for exclusive territory proposition. Knowlson-Stevenson Co., 1118 Packard, Ann Arbor, Mich.

NEW Invention—Sell every business. Four \$15 sales daily pay \$288 weekly. Walker made \$165 first day. Exclusive territory. Adjustment Service, Dept. PM, Mobile, Ala.

LADY Or gentleman—Sell sparkling glass name plates, house numbers, signs. 150% profit. Sample free. O. Vance, Wooster, Ohio.

HELP WANTED

WILL Finance married man 25-60, good appearance, fair education in a paying business of his own. Profits to start will average only about \$30.00 weekly but will increase as you learn the business. Must furnish all references and have car for delivery. Make application in own hand writing to McConna & Company, Room B-6609, Winona, Minn.

WANTED: Women who need quick money. "New Idea" imported ladies' necessity sells on sight; everyone buys; representatives everywhere are cashing in big. Miss Ely has made \$1,900; Mrs. Hart \$2,200, without experience. New salesplan put you in business for yourself. Sample free. Write Mary P. Coleman, Meriden, Conn.

AMBITIOUS Women make big money selling Priceless dress fabrics, dry goods, hosiery, lingerie, specialties. Full or spare time. Pleasant work. Samples furnished. Write Fitzcharles Co., Dept. 46, Trenton, N. J.

CASH Paid for Butterflies, Insects. See Singular Display Advertisement on page 18.

OBTAIN Employment desired, quickly, anywhere. Use "Ways That Win." Write Box 29-201, Station K, New York.

"THE Boulder dam, Eight years' work. Latest information regarding conditions, employment, concessions, etc., sent by return mail for \$1.00. Money back if dissatisfied. M. Roberts Service Bureau, Box 1051, Denver, Colo.

EDUCATIONAL AND INSTRUCTION

WANTED Immediately, men-women, 18-55, qualify for permanent government positions. \$105-\$250 month; no gov't experience required; paid vacations; common education; many needed soon. Write Ozment Inst., 101, St. Louis, Mo.

STAMMERING. Stuttering, other speech troubles, corrected. Wilson Schools, Dayton, Ohio.

MAIL Carriers, postoffice clerks. \$1,700-\$2,500 year. Steady work. Men 18-45. Frequent examinations. Common education. Particulars free. Write Franklin Institute, Dept. A-11, Rochester, N. Y.

"THE Personal Liberty Course"—A clever combination of myth, information and instruction for quickly overcoming fear, bashfulness and physical complexes in men. No drugs, no gymnastics. Full particulars free, sealed. Harry J. Gardener, P. O. Box 607, Station C, Los Angeles, Calif.

LEARN Aircraft welding, auto mechanics, electricity. Magnetos, radio. Big pay. Big demand. Low rates. Free catalog. Steinson School, 2008A Main, Kansas City, Mo.

MEN—Women, 18 up. Want a government job? \$105.00 to \$280.00 month. Steady work. Short hours. Paid summer vacation. Common education usually sufficient. Experience usually unnecessary. We coach you without leaving home. 32-page book with full particulars and sample coaching free. Write immediately. Franklin Institute, Dept. A-3, Rochester, N. Y.

INVESTIGATING And tracing. Work home or travel. Experience unnecessary. Write American System, 2188 Broadway, New York.

MEN, Women, everywhere. Manage your own business. Learn local advertising (distributing and supervising the distributing of free samples, folders, circulars, etc., and tacking-up signs). Unlimited opportunities. Complete instructions one dollar. John Wagner, Box 457, Palo Alto, Calif.

FIREMEN. Brakemen, baggage men (white or colored), sleeping car, train porters (colored). \$150-\$250 monthly. Experience unnecessary. \$10 Railway Bureau, East St. Louis, Ill.

DOUBLE Entry bookkeeping 60 hours with 8 keys; guaranteed. (Diplomas.) International Bookkeeping Inst., 8 Springfield, Mo.

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BIG Demand for photoplay talking picture and magazine stories. We revise, develop and copyright. Sell on commission. Established 1917. Booklet free. Universal Scenario Company, 406 Western and Santa Monica Bldg., Hollywood, Calif.

BECOME A landscape architect. Uncrowded profession; wonderful opportunity for money-making. Easily mastered by mail. Earn while you learn. Est. 1916. Write for details. American Landscape School, 29 Plymouth Bldg., Des Moines, Iowa.

U. S. GOVERNMENT Wants men, \$1,700-\$1,900 and up at start. Railway mail clerk examination coming. Let our expert (former government examiner) prepare you for this and also rural carrier, post office, customs, internal revenue, and other branches. Write today for free booklet. Dept. 8, Patterson School, Rochester, N. Y.

AMATEUR Cartoonists: Sell your cartoons. New market. Smith's Service, PR-1191, Wenatchee, Wash.

TRACE Missing people. Excellent paying work. Open to all. Write National Headquarters, 169 East 83rd, New York.

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STUDY A scientific profession. Microbiology. Bacteriology. Sanitation. Extension-residential course. Diplomas, degrees granted. Urinalysis outfit—prospector free. College of Microbiology, 23 State, Hammond, Ind.

LEARN Mechanical dentistry in Los Angeles. Earn \$40 to \$125 week. Day or night classes. 3 to 9 months course. Practical laboratory instruction. Professional standards. Free employment service. Write for free book. Smith Dental Institute, 747 South Hill St., Dept. 9, Los Angeles, Calif.

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TRACING. Make secret investigations. Work home or travel. Experience unnecessary. Write American System, 2188 Broadway, New York.

FLORIDA Information—Any five questions answered immediately, one dollar. Mr. Van, Gen. Del., Wildwood, N. J.

LOS ANGELES, Calif. Information. Anybody, any subject, \$1. Bureau, Box 313, Arcado Station.

TYPEWRITERS AND SUPPLIES

TYPEWRITERS—Factory rebuilt Royals, Remingtons, Underwoods, New Royal, Remington and Corona portables. New "Excelsior" Rotary Stencil Duplicator \$37.50. Catalog free. Pittsburgh Typewriter Supply, Dept. 945, Pittsburgh, Penna.

TYPEWRITERS. All standard makes, \$10 up. Fully guaranteed. Free trial. Write for complete illustrated lists. Northwestern Typewriter Exchange, 121 N. Francisco Ave., Chicago.

TYPEWRITERS—All makes, \$8 to \$32. Fully guaranteed. Dee Typewriter Exchange, Ada, Okla.

ADDING MACHINES

NEW \$3.50 Automatic adding machine. Adds, subtracts, multiplies, absolutely accurate. Capacity \$999,999.99. Fully guaranteed. 75,000 pleased users. Makes adding easy, positive, quick. Eliminates mistakes. Saves time. Postpaid \$3.50. Bassett Co., 1453-C, Hollywood Ave., Chicago.

PRINTING, ENGRAVING AND MULTIGRAPHING

1,000 BOND Letterheads, envelopes, billheads, statements, cards, \$3.45 each. Satisfaction, samples. H. Curtis, 811 Harrigan, Kalamazoo, Mich.

PRINTING—All kinds. Superior work—low prices. Samples. Battiefield Printers, Box 306, Gettysburg, Penna. Battiefield source.

"NEARLY ALL"—If particular. Special 250 envelopes, 500 3 1/2 x 11 letterheads \$4.44 postpaid. Solidlids, Knox, Ind.

1,000 BUSINESS Cards \$2.75 postpaid. Samples free. John Miller, Montgomery Ave., Northerly, Pa.

INTRODUCTORY Special 50 cards, 50 letterheads and 50 envelopes, all for \$1.00. Quotations on various printing solicited. Congress Printing Company, 2402 West Division, Chicago.

MULTIGRAPHING Business correspondence two dollars thousand. Hammermill letterheads, four dollars; inexpensive quality, three dollars. Miscellaneous printing. Mayera Corporation, Monmouth, Ill.

ART Ad slips, 3 1/2 x 5 1/2, 200 words, attractive colors: 1,000, \$2.00; 5,000, \$5.00, prepaid. All printing low prices. Samples. Goodprint, Harrisonburg, Va.

PRINTING—Low prices, fine work. New price list and samples. Stationery, circulars, folders, booklets, catalogs, ruled forms. Sell direct, large or small orders. Large modern plant in small town, low operating cost. Sheppard Publishing House, Inc., Box 1110, Strasburg, Virginia.

QUALITY PRINTING! Reasonable Prices! Send for Free Standardized samples and prices. Folders, Circulars, Catalogs our specialty. Earnest Fantus, 525 South Dearborn, Chicago.

250 BOND Letterheads, Envelopes, Billheads, Cards, \$1.35 each. Economic Press, Leonia, N. J.

WE Print stationery, booklets, catalogs, circulars, Samples. Commercial Press, Batavia, Ohio.

200 LETTERHEADS And 100 envelopes \$1.00. 200 letterheads, 8 1/2 x 11, 150 envelopes \$2.00. 250 cards \$1.00. Hoosier Print Shop, Portland, Ind.

200 NOTE Sheets and 100 envelopes \$1.. Brown, Warsaw, N. C.

SAMPLES Raised letter printing with special prices free. LaClyde Service, Westfield, Mass.

PRINTING OUTFITS AND SUPPLIES

PRINT Your own stationery, cards, bookplates, Christmas cards, circulars, books, pamphlets, etc. Junior press, \$5.00; Job press, \$11; rotary, \$149. Print for others. Easy and interesting; rules sent. Write for catalog presses, type, paper, etc. Kelsoy Company, L-14, Meriden, Conn.

PRINTING OUTFITS—Presses, type supplies, type novelties. Send stamp for catalog. Model Press, York, Penna.

GUMMED LABELS

1,000 PRINTED; Name, business, address 50c. JRS Company, Box 93, Holyoke, Mass.

RUBBER STAMPS

RUBBER Stamps! Name, address, two lines 25c; three lines 35c. DeLuxo Stamp Works, B572M, Auburn, Nebr.

DUPLICATORS AND DEVICES

YOU Can make 50 to 100 copies of a letter, notice, etc., at a cost of three cents on a Hoyer Quality Duplicator. Write for free trial offer. The Hoyer Duplicator Co., 909 Jackson Blvd., Chicago, Ill.

"EXCELOGRAPH" Portable rotary stencil printing duplicators \$39. Terms. Description, testimonials, printed samples, free. Pittsburgh Typewriter Supply Co., Dept. 531, Pittsburgh, Pa.

FOR THE HOME

GRANDFATHER'S Clock Works. \$5.00. Build your own case; instructions free; make good profits selling your friends. Clock works with chimes for old or new cases. Write for full particulars. Clock Co., Ruffner St., Philadelphia.

CEDAR Chests only \$11.65—"Red-I-Kut" complete with rich copper trim—you assemble and save half—send for pictures. Kuempel Furniture Company, Guttenberg, Iowa.

FOR MECHANICS

A BIG Opportunity in 8-hour battery charging, or 20 minute car washing. Let me tell you how you can install equipment with practically no investment. Earn \$150 to \$300 monthly. Bargains in used outfits. Also a few reconditioned buffers, grinders, air compressors, paint sprays, arc welders. Write today. Ken Byrum, Box M, Troy, Ohio.

MINUTE Men pants eliminate belts and suspenders. Olivebark sample, \$2.75. Two \$5.00 postpaid. State size. Veteran Outfitters, 7516 97th Ave., Ozone Park, New York.

AUTO Mechanics demonstrate new auto invention on side. \$50 extra money each week. Free trial offer. Aerostat Co., 3601-P Villet St., Milwaukee, Wis.

FOR SMOKERS

TORACCO. Virginia Gold Leaf. Smoking, chewing, mild, mellow. Like rare old wine. Four pounds \$1 postpaid. Belmont Farms, Box A, Chatham, Va.

FOR MEN

EXTRA Special offer. Men's fancy socks. Guaranteed first quality. For a limited time only, we offer these at \$4.95 a dozen pairs, postpaid to your address. Satisfaction guaranteed. Badger Sales Co., Dept. A, Whitewater, Wis.

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GILLETTE Razor blades sharpened to perfection, 1c each. Patter Wetterquist, Rockford, Ill.

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MAKE 16' Rowboat. Blueprint 30c. Weesho-Uco, 31st Office, Detroit, Mich.

BUILD Your own boat using our ready cut semi assembled materials. 55 designs. Outboard speedsters, cruisers, runabouts, launches, sail, row. Send 10c for catalog. Hurry if for this season's use. Brooks Boat Co., Inc., Saginaw, Mich., Box NN.

HUBBELL Marine Coolers convert Ford engine into marine motors. Booklet free. Ford speedboat easily built, large blueprint and directions one dollar. C. C. Hubbell, Perry Ave., Norwalk, Conn.

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STEER Horns, six feet spread for sale. From the longhorn species of cattle now extinct. L. Berillion, Mineola, Tex.

WAR Relics and guns. Lists fifteen cents. Young, 175 Washington Ave., Belleville, N. J.

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WE Are dealers in rough and polished minerals and polished semi-precious gems for scientific, educational, cabinet display or jewelry craft purposes. List of gem minerals and their varieties, table of birthstones and price lists free with an order for any of the following. PM Special—Six assorted rough and polished minerals for \$1. Four genuine mined, fully polished gem stones \$1. Two interesting Montana mineral specimens 35c. Any of these postpaid, correctly labeled and with satisfaction guaranteed. The Gem Shop, Box 373, Wolf Creek, Mont.

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BUILD Your own phonograph. Parts catalog and instructions to build new horn, mailed for 10c. American Phonograph Co., 4116 West 24th Place, Chicago.

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BANJO Ukulele, \$2.10; circular free. Press, 708 No. E. 31st, Portland, Oreg.

SONGWRITERS! Melody for your words, one dollar. Frank Little, Nipomo, Calif.

VOLINS—Hand-made masterpieces. John Lehto, 925 14th San Pedro, Calif.

FREE! Song Writers Guide. Beaver, 1257 Elm, Green Bay, Wis.

MAKING Violins. Plans and instructions free. For particulars write Rodell Music House, New Bedford, Mass.

SONGWRITERS—Successful songs earn fortunes. Submit poems. Brennen, Musical Director, L1656 B'way, New York.

POEMS Wanted. Work guaranteed. We publish. Great Eastern Song Bureau, Dept. 27, Thomaston, Me.

SEND Song poems, 50-50 plan. Indiana Song Bureau, (Brookside), Salem, Ind.

COMPOSERS—Verse or music. Brilliant opportunity. Write Van Buren, 1875 McClurg Bldg., Chicago.

SONG Poem writers. Write Sequoia Songwriters' Service, Sherman Branch, Los Angeles, Calif.

VOLINS. Deep, mellow, soulful—on credit. Easy terms for wonderful instrument. Get details today. Gustav F. Henning, 302 University Building, Seattle, Wash.

SONG-POETS—"Your Best Bet." Healy, Liberty Theater, Colorado Springs, Colo.

CORNETISTS—Trombonists—Saxophonists—Clarinetists. Get "Free Pointers." Name instrument. Virtual School, Buffalo, N. Y.

PLAY Piano by ear. A sound system. Booklet free. Boucher's Harmony Studio, Ottawa, Can.

SONG Poem writers; "Real" proposition. Hübeler, D1, 2104 N. Keystone, Chicago.

"MUSIC Composed" to words. Bauer Bros. (formerly of Sousa's Band), Oshkosh, Wis.

SONG Writers. Send for our "Publishing Agreement." McKinley Music Printers, 1501 E. 55th St., Chicago.

WHITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 201 N. Hoyne Ave., Chicago.

SONG Poems solicited. A different proposition. Richard Broughton, Sioux Falls, S. Dak.

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PERCY S. WEBSTER, 203 Saving and Loan Building, Stockton, Calif. Patent booklet free.

"INVENTOR'S Guide," valuable information, free, Frank Ledermann, Registered Attorney-Engineer, 1712 Woolworth Bldg., New York.

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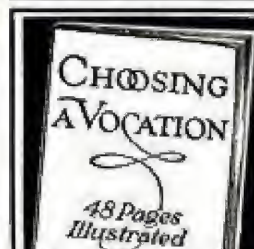
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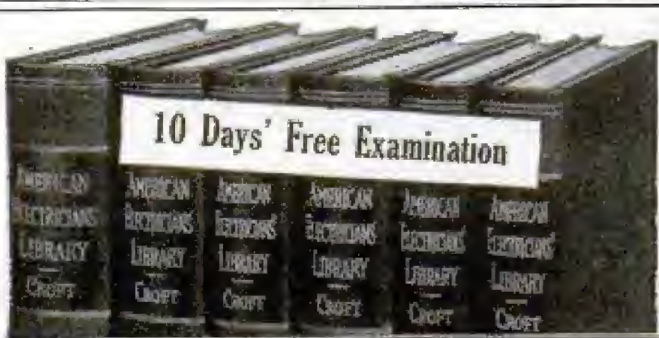


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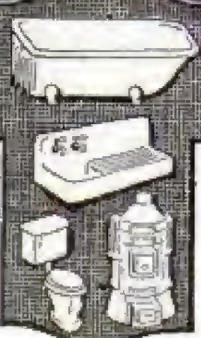
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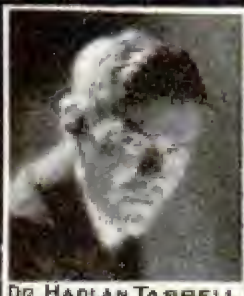
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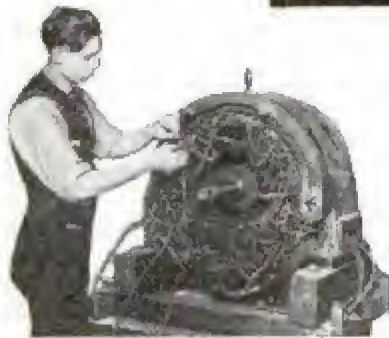
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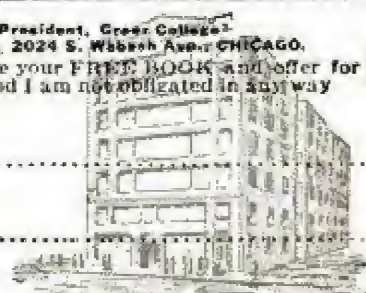
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| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Grade School Subjects |
| <input type="checkbox"/> Secretarial Work | <input type="checkbox"/> High School Subjects |
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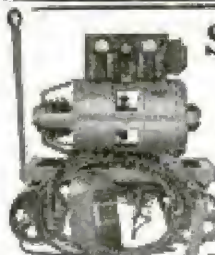
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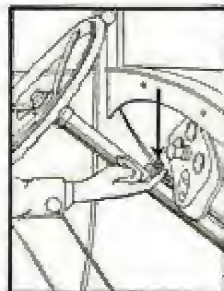
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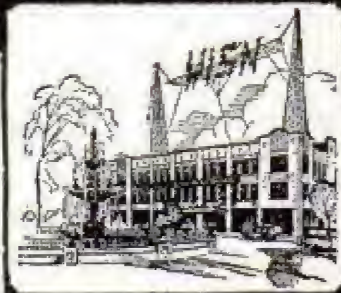
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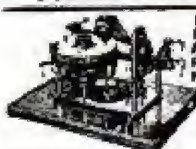
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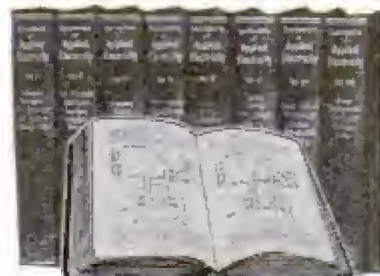
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We include wall exercising parts which permits you to develop your back, arms and legs—a real muscle necessity. You know that business men and athletes, too, first show their age in their legs. Develop your leg muscles with the foot strap which we furnish. This will give you speed and endurance—but that isn't all that you get. In addition we include a specially written course which contains pictures and diagrams showing you how to develop any part of your body so that you will quickly get on with these exercises and gain the greatest advantage from their use. Act now while you can get in on this special offer. It might be withdrawn, so rush the coupon.

SEND NO MONEY

All of the items pictured on this page are included in this big special reduction offer. Sign your name and address to the coupon below and rush it to us. We will send your ten cable chest expander, the wall parts, a pair of hand grips, foot strap and the course by return mail. Pay the postman only \$5.00, plus the few cents postage on arrival. (If you desire to send check or money order in advance, we pay postage.)

GUARANTEE

All Crusader products are guaranteed to give entire satisfaction or money back.

Crusader Apparatus Co.,
Dept. 109, 44 Parker Ave., Maplewood, N. J.

I accept your offer. Send me everything described in your advertisement by return mail. I will pay postman \$5.00 plus postage on arrival. It is understood if I am not entirely satisfied after examination I can return the goods and you will refund my money.

Name.....

Street.....

City..... State.....

Boys

*I'm surely happy
that I can earn
these dandy Prizes!*



Any one of these prizes can be yours without costing you a cent of your own money. Hundreds of boys are doing it. You can do the same. Send the coupon now and learn how easily you can earn money & prizes.



By being a Crowell Junior you will have an opportunity to earn the things you want most. The prizes shown here are only a few of the 300 you can get. Every prize is of the finest quality and one you would be proud to own.



How proud you would be and how your chums would envy you if you owned this snappy wrist watch or fielder's glove. Every prize is of the finest quality. The coupon mailed today will bring you information on how to quickly get it.



Smiling Ted Thomas is the proud owner of his own baseball equipment. He is one of the many hundreds of boys who are earning their own money, baseball equipment, bicycle, radio, wrist watch and many others selected from our Big Book of Prizes.

Ted is a Crowell Junior Salesman. He delivers The American Magazine, Woman's Home Companion and Collier's, The National Weekly, to regular customers. These well known magazines make Ted's work as easy as play.

Your name and address mailed on the coupon will bring you full information and start you in business at once. Send the coupon now!

Mr. Jim Thayer, Dept. 116
The Crowell Publishing Company
Springfield, Ohio

Dear Jim: I want to earn money and prizes. Please start me off as a Salesman.

My Name.....

Address.....

Town.....State.....

Mail this Coupon Now →

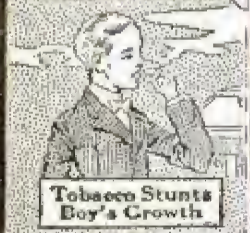
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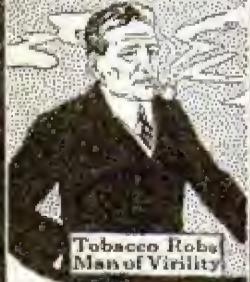
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Tobacco Steals
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Pleasures, Com-
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of Life

Tobacco Habit Banished Let Us Help You

Quick Results

Trying to quit the tobacco habit unaided is often a losing fight against heavy odds, and may mean a serious shock to your nervous system. So don't try it! Make the tobacco habit quit you. It will quit you if you will just take **Tobacco Redeemer** according to directions.

It doesn't make a particle of difference whether you've been a user of tobacco for a single month or 50 years, or how much you use, or in what form you use it. Whether you smoke cigars, cigarettes, pipe, chew plug or fine cut or use snuff—**Tobacco Redeemer** will positively remove all craving for tobacco in any form in a few days. Your tobacco craving will usually begin to decrease after the very first dose—there's no long waiting for results.

Tobacco Redeemer contains no habit-forming drugs of any kind and is marvelously quick, scientific and thoroughly reliable.

Not a Substitute

Tobacco Redeemer is in no sense a substitute for tobacco, but is a radical, efficient treatment. After finishing the treatment you have absolutely no desire to use tobacco again or to continue the use of the remedy. It helps to quiet the nerves, and will make you feel better in every way. If you really want to quit the tobacco habit—get rid of it so completely that when you see others using it, it will not awaken the slightest desire in you—you should at once begin a course of **Tobacco Redeemer** treatment for the habit.

Results Absolutely Guaranteed

A single trial will convince the most skeptical. Our legal, binding, money-back guarantee goes with each full treatment. If **Tobacco Redeemer** fails to banish the tobacco habit when taken according to the plain and easy directions, your money will be cheerfully refunded upon demand.

Let Us Send You Convincing Proof

If you are a slave of the tobacco habit and want to find a sure, quick way of quitting "for keeps" you owe it to yourself and to your family to mail the coupon below or send your name and address on a postal and receive our free booklet on the deadly effect of tobacco on the human system, and positive proof that **Tobacco Redeemer** will quickly free you from the habit.

Newell Pharmacal Company
Dept. 300, Clayton Station, St. Louis, Mo.



Free Book Coupon

NEWELL PHARMACAL CO.,

Dept. 300, Clayton Station, St. Louis, Mo.

Please send, without obligating me in any way, your free booklet regarding the tobacco habit and proof that **Tobacco Redeemer** will positively free me from the tobacco habit or my money will be refunded.

Name.....

Street and No.....

Town..... State.....



Actual size of Magic Dot, which weighs less than 1/25 of an ounce, yet holds rupture more securely than pounds of steel springs, and hard, gouging cushions.

Beware the Small Rupture

THAT "DOESN'T BOTHER MUCH"



Light as a Feather Yet... Holds Rupture!

Now—An Ohio Scientist Is Helping Nature Rescue Thousands Of Rupture Victims From The Eternal Horror Of Many Dangerous Cumbersome Trusses And Other Torturous, Harness-Like Contraptions. He Has Perfected A Tiny, Feather-Weight Magic Dot That Frequently Offers Joyous Relief And New Comfort From The First Day. Countless Former Truss Victims Everlastingly Thank This Interesting Discovery For Their New Happiness. Just Mail The Coupon For Free Sample If You, Too, Want New Freedom.

SCIENCE has at last developed a tiny, interesting rupture device weighing less than 1/25 of an ounce, which has freed and amazed thousands of rupture sufferers and won the admiration of many doctors and scientists.

Its results are often so remarkable—so quick—you may wonder how such a simple, tiny invention can accomplish almost miraculous benefits. It makes utterly obsolete all painful trusses, gouging knobs, steel springs and unsanitary, cumbersome leg straps.

It "Breathes" Air

Magic Dot anchors a flesh-soft padlet composed of a newly perfected substance named Airtex. This is honey-combed with microscopic air cells that tend to "breathe" air with each movement of your body. It expands and contracts as easily as your own flesh. When you walk, run, bend or exercise it tends to squeeze itself—not the part of the body it rests against.

It is so light—so comfortable—the wearer as a rule hardly knows he has it on. It does not produce that "hot spot" feeling. Sanitation is now more sure—because the padlet can be washed clean and sweet in a jiffy.

Immediate relief and new comfort are not the only things the New Science System should accomplish. Of far greater importance is the comfort you have dreamed of—the possibility of ultimate FREEDOM! This should be possible because this amazing new method gives nature a chance to heal the rupture automatically. This is not possible with gouging trusses that prevent free circulation.

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Send no money. Just mail the coupon for Free Sample of remarkable Airtex. With it we send, without charge, latest copy of a very new and informative book on Rupture and Hernia that should open your eyes.

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Without obligation send me a no-cost Airtex sample with new book about rupture and hernia relief.

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Susceptible Subjects
How to Hypnotize by Telephone
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How to Do Dozens of Hypnotic Feats
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Learn the real secret of powerful chest building. Know all about the muscles that lift, widen and deepen the chest and broaden the shoulders. Practice the specialized exercises which will make **YOUR** chest massive and powerful. The greatest analysis of vital, vigorous chest development ever written. Learn the Hindoo religious system of exercises that makes their wrestlers and strong men invincible. A Hindoo strong man and wrestler threw Zybsco in two seconds. Many other methods unknown to the American body builder, are explained. Complete with anatomic illustrations on which are indicated the little known vital spots in creating vital internal strength. You can build for yourself a Herculean chest. The author, George F. Jowett, built his chest from 32 inches of weakness to 48 inches of colossal muscular strength. Develop your chest with straps of big steel muscle. Fill it full of unresisting vital strength energy.

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To each purchaser will be given a **FREE COPY** of *THE THRILL OF BEING STRONG*. It is a priceless book to the strength fan and muscle builder. Full of pictures of marvelous bodied men who tell you decisively how you can build symmetry and strength the equal of theirs.

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A Year With One Single Blade

"I want to say that KRIS KROSS Stroppler is the best thing I ever saw. I have been using one blade continuously for one year and nine months and have no idea how much longer it will last."

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Inventor Discovers Amazing New Way to Shave! —Without Buying Blades!

K EEN, velvety shaves forever and no more blades to buy! That's what the astonishing invention of a St. Louis man offers the great army of American shavers today!

KRIS KROSS is destined to revolutionize all existing traditions of shaving! Its performance is so sensational that it seems hardly fair to call it a stroppler. Rather it is a super-stroppler or blade-rejuvenator! No longer do you find that your blades "die" after five or six shaves. KRIS KROSS "brings 'em to life" a surprising way! Actually—you can take a blade right out of a fresh package and improve it as much as 100% in eleven seconds with KRIS KROSS!

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KRIS KROSS employs the famous *diagonal stroke*, same as a master barber uses. Never before has anyone captured the secret of reproducing it automatically. Eight "lucky leather grooves" do the trick in 11 seconds with a precision it takes a master barber years to attain. Strops from *heavy* to *light*. Adjustable, automatic jig flies up and notifies you that your blade is ready—ready with the keenest cutting-edge that steel can take!

KRIS KROSS produces unbelievable sharpness and prolongs the life of any razor blade for months and even years. Fits all brands and makes except Durham. Eliminates 83% of shaving costs and solves your blade problem for all time!

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To introduce KRIS KROSS stroppler, we are including this month free sample of a revolution in razor blade construction. Made to fit your present razor. Guaranteed to last longer and

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Send for full information on these surprising new inventions today. KRIS KROSS products are never sold in stores. You deal direct with me or my authorized representative. Write for illustrated description and free sample blade. It's even more remarkable than I can tell you in this short space. Clip the coupon now. Mail it today.

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City..... State.....



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[Burns Outdoors as Well as Indoors]

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So efficient it produces twice the amount of heat of City gas at half the cost. So simple anyone can install and operate. Double generator assures continuous operation without shut-downs. Nothing to wear out, starts in a jiffy, will last a life time. Every burner guaranteed fully. Write for special introductory price and free catalog of outdoor utility and kitchen stove oil burners.

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Clarence Heffelfinger,
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**\$500 a month**

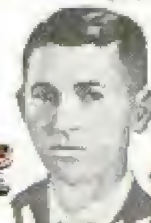
"When I enrolled with the N. R. I., I was a motorman on a trolley car. Now I have a fine, fast-growing Radio business. When only half way through the course started bringing in extra money. I made \$420 in my spare time. Now I have a bank account of \$2800 and about \$300 worth of stock. It has all come from Radio since graduating less than six months ago. I cannot begin to express my thanks to you and all those connected with N. R. I. for what you have done for me."

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"In addition to my regular work in what I believe to be the largest and best equipped Radio Shop in the Southwest, I am now operating KGFI. I am proud of the fact that I installed and put KGFI on the air without help of anyone except the N. R. I. I am averaging \$450 per month."

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READ what Big Money my men make in RADIO

\$350, \$450, \$500 a month. That's making real money. What business other than Radio offers such opportunities after six to twelve months training? None that I know of. More proof—last year electricians, farmers, mechanics, clerks, railroad men, bookkeepers, preachers, doctors, and men from 78 other trades and professions enrolled with me to prepare for the Radio field.

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A WONDERFUL business, you will say, to make men trained for other fields, give them up for Radio. Yes, but they had their eyes wide open. They know what you and I know—that big growth makes big jobs and many opportunities to earn big money. Heffelfinger, Jones, and Butler couldn't make anything like this money before, although they probably worked just as hard—maybe harder. Trained men are needed for the big jobs the amazing growth of Radio is creating.

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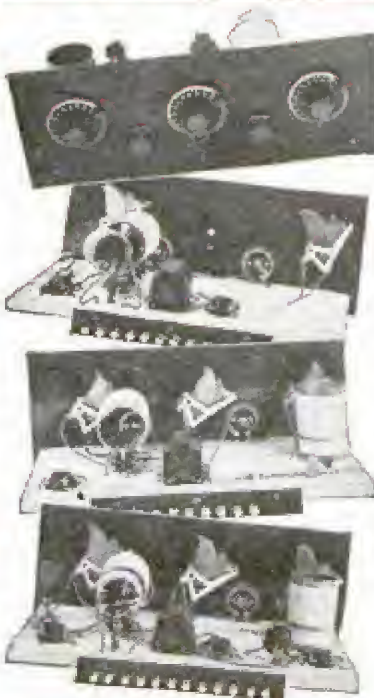
I GIVE you six big outfits of Radio parts. With them you can build and experiment with one hundred different circuits—learn the "how" and "why" of practically every type of set made. This makes learning easy, interesting, fascinating, your training complete. Nothing else equals my method.

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NO NEED to leave home. Hold your job, give me one-half to one hour a day of your spare time. In six to twelve months you can be a trained Radio Man, ready to step into a new job with a real future.

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MY 64-page book explaining where the big jobs are and what you can make is FREE. Mail coupon. No obligation. Address: Dept. 9 WFP J. E. Smith, Pres., Nat'l Radio Institute, Washington, D. C.



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J. E. Smith, President,
Dept. 9 WFP National Radio Institute,
Washington, D. C.

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A simple new tire attachment that automatically warns the auto driver when any tire becomes partly deflated or needs air, and, as a result, makes it easy to keep tires up to proper air pressure at all times and get increased mileage, is the invention of D. B. Simpson, 3000M—307 W. Douglas, Wichita, Kansas. Now broken down casing walls and rim-cuts, due to running on half-deflated tires, are banished forever. Anyone can install a set on his tires in a few minutes and no special tools are required. To introduce, the inventor offers to send a sample on free trial at his risk. He wants distributors and agents who can make \$350 to \$1,200 a month handling the big business to be built up. Write him today.

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YOU'RE NEXT

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ONE—TWO—THREE! Just like that the man you see at the right changed from a puny weakling into a physical **GIANT!** Looks like magic, doesn't it? But it isn't. It's just an example of what Titus Training has done for thousands upon thousands of men.

I've taken fellows of every size and condition and transformed them into perfect specimens of manhood! I've been doing it for years. "Miracles worked in Muscle" people call them. But they are *scientific* miracles, because I've made a science of building men. Nobody else knows the secret of my methods—but *I* know, and I know they'll do the same for you as they did for the lad shown here.

I'll Increase Your Muscles by INCHES

Yes sir, and all I want is 30 days—and just 20 or 30 minutes a day. In that short time I'll put layer after layer of muscle all over your body till they stand out like iron bands. And they'll be panther muscles, friend—muscles as live as spring steel—with the speed of lightning and the power of a battering ram. Those are the kind of muscles that make champions, the kind of muscles that will make you laugh at men twice your size.



Wear This Medal

Strong men all over the world wear it. Made of solid statuary bronze and given to you free.

**Mail this Coupon
TO-NIGHT!**



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**Amazing Book
Of Muscle-
Building Facts**

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The One and Only **TITUS** 105 E. 13th St.
New York City



ONE! This boy looks pretty hopeless, doesn't he? I'll bet he hated to step out on the beach in a bathing suit, and he had to stand a lot of bullying from the other boys in the gang.



TWO! Here's a real man! Just look at the wonderful improvement that muscles make in a man's appearance.



THREE! And this picture shows every muscle in his body developed to giant size. Don't you want to look like this? Need I urge **YOU** to mail the coupon?

TITUS, Dept. M-142

105 E. 13th St., New York, N. Y.

Dear Titus: Sure I'd like to have your book. Send it free.

Name.....

Address.....

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Mechanical Engineering

Learn at Home

MECHANICAL Engineering embraces the design, construction and operation of machines and machine tools. It is a profession which offers almost unlimited opportunities to men who combine natural mechanical ability with technical training.

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One of the best ways to train yourself to secure a position as a Mechanical Engineer is through the home-study courses of the International Correspondence Schools.

These courses are complete and up-to-date, and especially arranged to meet the needs of the student who studies at home.

They are particularly helpful because they are written by well-known mechanical engineers with years of practical experience, who know the quickest, best way to solve every problem.

Just mark and mail the coupon and we'll gladly send you Free Booklets describing the I. C. S. courses in Mechanical Engineering or any other course in which you are interested.

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| <input type="checkbox"/> Architectural Draftsman | <input type="checkbox"/> Plumbing Inspector |
| <input type="checkbox"/> Building Foreman | <input type="checkbox"/> Foreman Plumber |
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| <input type="checkbox"/> Structural Draftsman | <input type="checkbox"/> Steam Engineer |
| <input type="checkbox"/> Structural Engineer | <input type="checkbox"/> Marine Engineer |
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HERE is your opportunity to find out how much talent you have. Our simple, scientific Questionnaire tests your natural sense of design proportion, color, perspective, etc. It may show you the way to a bigger future—a real career.

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You can't lose. We agree in writing to give you the training and employment service necessary to get a better job at bigger pay or refund every cent. Big Free book tells everything. Mail coupon today and find out how easy it is to take this short-cut to real money-making. No obligation. Write now, while low introductory price is in effect.

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As the 160 mile an hour monoplane is swifter than the old Pony Express so is our new **MOTION PICTURE** training superior to the old methods.



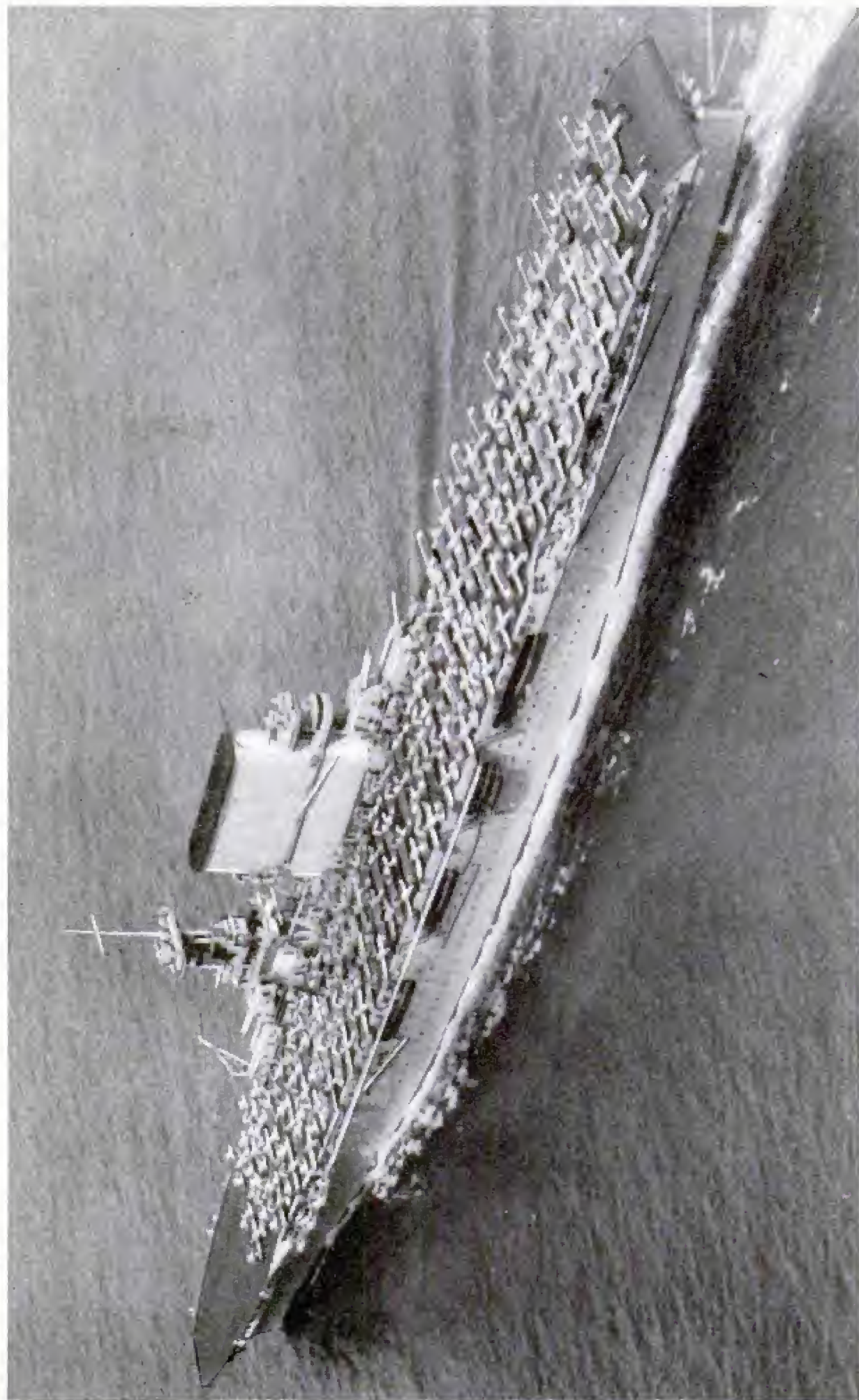
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537 S. Dearborn St., Chicago, Ill.
Send book, "The Film Way to Bigger Pay," with facts about this new, easier way to master electricity.

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The NATIONAL SCHOOL of
VISUAL EDUCATION

"The Film Way to Bigger Pay"

8/16



More than Eighty Fighting and Bombing Planes Are Here Seen Accommodated with Ease on the Top Deck of the U. S. S. "Saratoga," the Navy's Giant Aircraft Carrier.
the Mother Ship Becoming a Veritable Floating Airport When It Goes to Sea with Its Full Complement of Winged Fighters

Popular Mechanics Magazine

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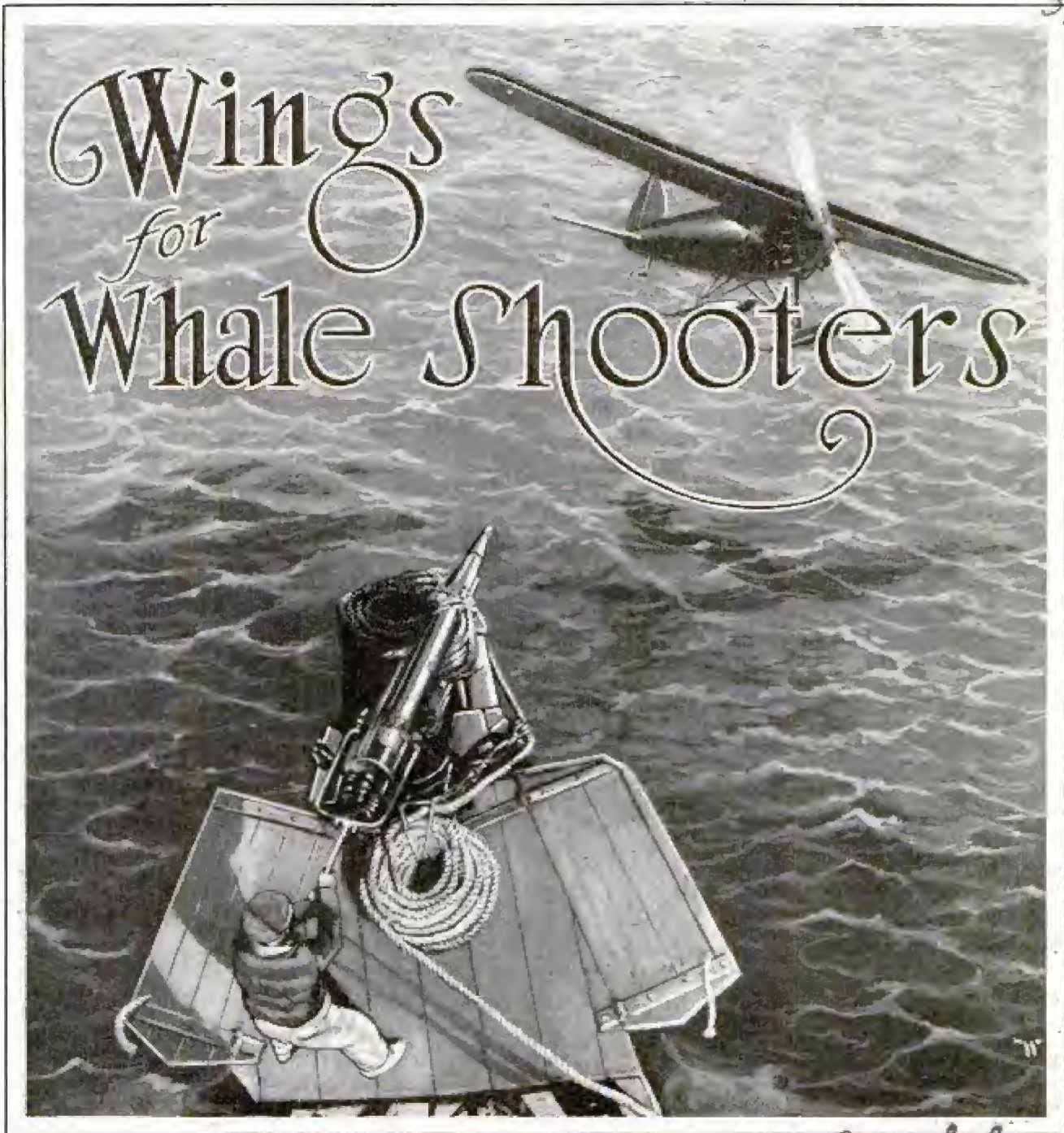
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 52

SEPTEMBER, 1929

No. 3

3175-



By ANDREW R. BOONE,

*613 Spreckels
Theatre Bldg.*

THE "whale shooters," those members of that select and very exclusive fraternity of Norwegians who amass large fortunes from the frigid sport of arctic and antarctic whaling, are to be augmented by aerial observers. Two pilots from the royal Norwegian navy, already known to the world for their daring ex-

ploits during the Amundsen and Nobile rescue expeditions of 1925 and 1928, are to spot schools of whales along the antarctic ice banks.

Whale shooters come from a small section around Sandefjord. Rarely does an outsider join the ranks of the Norwegian whaling fleets; outsider, that is, in a whal-

San Diego, Calif. 353



ing sense. Yet Commanders Rit-zow Holm and H. Riiser-Larsen, having been granted leave from their naval duties, accompany a twenty-whaling-ship expedition which left Norway in the early part of August for the ice banks of the Antarctic, where, from two model airplanes, they will endeavor to spot the whale schools and guide the surface ships to them.

The tragedy of antarctic whaling lies in the fact that during some years the schools of whales seem to disappear. Commander Holm, during his recent trip to the United States, explained that one of his missions will be to study whale habits and to learn if possible whether whaling men can anticipate their movements from year to year and thus gather in the annual harvest of 30,000 leviathans of the southern deep.

Commander Holm, who will be the pilot, and Commander Larsen, who will serve generally as observer, will look out upon the antarctic wastes from two planes. The larger is a Lockheed monoplane approximately duplicating that in which

Capt. Sir George Hubert Wilkins flew across the north pole. The other is a Norwegian navy reconnaissance, two-place, open-cockpit, low-wing monoplane, powered with a 260-horsepower water-cooled engine. The American plane is powered by one of the famous "Whirlwinds" which have carried many flyers across oceans. These ships of the air will be transported to the scene of their frigid operations aboard the "Norvegia," a small vessel of 285 tons that is attached to the whaling fleet. The American monoplane will enable the flyers to remain aloft thirty-eight hours during their long flights, many of which will be made far out of sight of their icy base.

Airplanes do not fly in the Antarctic on gasoline and oil alone, however. Provision must be made to meet the intense cold that is encountered. The Holm-Larsen American plane carries, in addition to the necessary apparatus for heating the engine and oil before starting, large special grease



Top, Cover to Keep Engine Warm; Center, Playing a Harpooned Whale; Below, Hauling It Aboard

containers for the rocker arms. A flyer never would be able to start his engine in those high latitudes, were it not for mechanical heat aids. Commander Holm arranged, when in California, to insulate engine, lines and crankcase against cold.

In starting the engine on a cold and frosty morning, he lights two oil heaters held in a metal container immediately below the radial engine, which is swathed in three layers of cold-resisting material. Next the metal is a jacket of canvas, while the second layer consists of a quilted blanket. On the outside is laced a covering of rubberized balloon cloth. A woven rope, its ends bound in metal tips, laces the covering tight, to prevent escape of heat. When the intake manifold is warmed to ninety degrees, the engine is started and immediately a helper pours the oil, which meanwhile has been heated, into the crankcase. A special cowling protects the engine against the intense cold while in the air.

Of course, the value of airplanes in antarctic whaling work remains to be seen. On the basis of his arctic experiences, however, Commander Holm believes their great range and speed, coupled with the added visibility from altitudes, will help speed the whaling fleet's work.

Holm and Larsen will operate their planes either from the water or from the hard surface offered by the ice. Three sets of skis, a set of pontoons with replacements and a set of wheels accompany them for use as landing gear. Radio has been installed in the American plane. On spotting a school, the old familiar, "There she blows," will speed through the air on wings of electricity to radio operators on the ships below.

But how will these flyers find their way about with no points of reference to watch as they fly out of sight of their ships? Sun compasses of German design will show them at all times their exact location by registering the spot on a glass plate. The sun compass turns with the same speed as the sun. It is operated by clock mechanism. The compass also is inclined to the path of the sun. Therefore, as the sun shines into it, consideration having been taken of the sun's angle and the speed of flight, the spot on the glass plate indicates the direction of flight.



Dummy Dressed as Policeman Calls Attention of Motorists to Traffic Signs in Indiana Town

DUMMY "COP" CALLS ATTENTION TO TRAFFIC SIGNS

Dummies dressed in police uniforms serve as traffic "cops" in West Lafayette, Ind. The figures are placed at the street intersections, where there are stop signals and other traffic directions, and serve to call the attention of motorists to them.

NUMBERS PRESSED IN STEEL BY ROTARY STAMP

Saving time lost in picking out and inserting figures, a numbering stamp with a



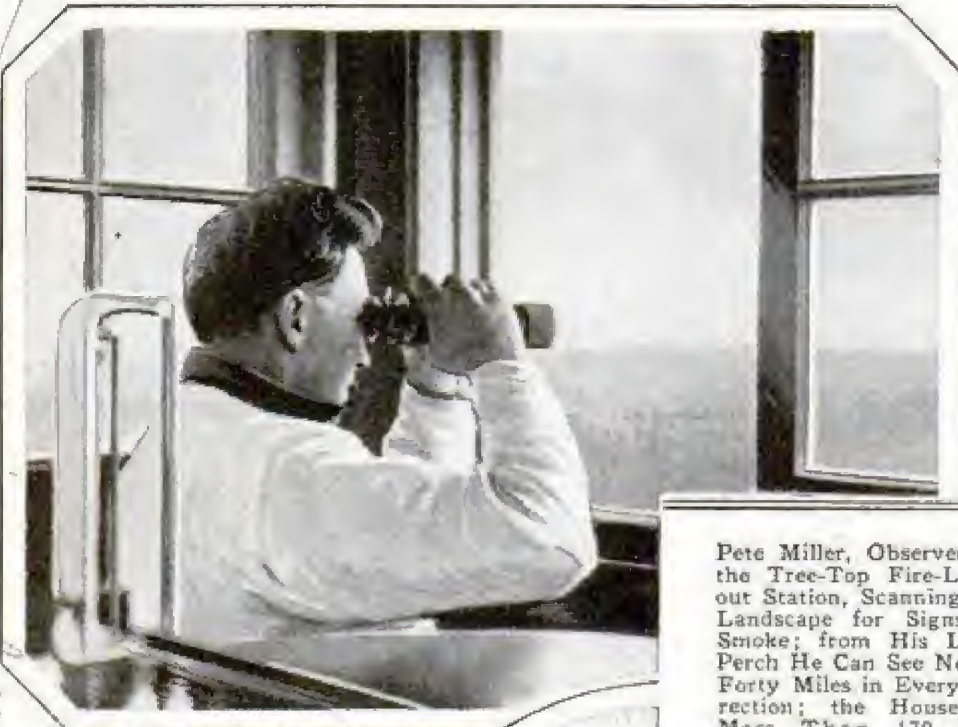
rotary steel wheel is on the market for hand impressing of numerals. The compact instrument contains twelve characters in each wheel and fits in the vest pocket. It also uses various-size wheels which are interchangeable.

5161
cmr. E. R. Warren
West Lafayette, Ind.

3139
1 folder and one wheel - \$0.50

Apex Products Co.
54 Van Cortlandt
Post Office, New York, N.Y.

FIRE STATION IN TREE TOP GUARDS BIG FOREST



Pete Miller, Observer, in the Tree-Top Fire-Lookout Station, Scanning the Landscape for Signs of Smoke; from His Lofty Perch He Can See Nearly Forty Miles in Every Direction; the House Is More Than 170 Feet above the Ground



Miller at the Base of the Tree, Which Is Eight Feet in Diameter; Detail of the Ladder, a Spiral Series of Inch Steel Rods, Threaded with Steel Cable, and View of the Whole Lookout; the Tree Is Securely Guyed by Steel-Wire Ropes, Fastened Just below the House and Attached to Stumps near the Base; the Lookout Station Is Connected to a Fire Headquarters by Telephone; at the Observer's Command, a Speedy Gasoline Truck and Trailer, Loaded with Pumps, Hose and Tools, Are Dispatched to the Scene of a Blaze



Colo 3011
 Capt. Frank S. Reynolds 615 W. Railroad Ave. Fort Morgan,
 on Smoky Mountain Indian Reservation near Hopeman, Wash.

1440 Broadway
New York

PLANE "GROWS UP"
AS THE STUDENT
PROGRESSES

Easily adaptable to conversion, a mono-biplane which "grows up" with the student pilot operating it has been placed on the aviation market. Designed to advance in performance as its owner improves in flying, it is operated first as a biplane with throttle blocked, thus making an ideal training plane for the novice. As the student demonstrates his ability, the throttle block can be advanced or removed entirely, giving full benefit of biplane performance, and when the final stage of training has been reached, the biplane wings may be replaced by one of monoplane type. In this form the ship has a wide cruising range, relatively high speed and ability to land in 225 feet and take off in 200 feet with a full load. Tests have shown that it will throttle to less than thirty miles an hour in the air, and reduce the risk of stalling or spinning.

ELECTRIC EGG COOKER NEEDS
NO WATCHING

Without watching or timing, an electric egg cooker boils, poaches or fries eggs and stops automatically when they are done. Water is poured in the top of the cooker in specified amounts, the water completing the electric current and being turned to steam to cook the eggs. When the water is gone, the eggs are cooked, and the current is broken. The cooker has a capacity of eight eggs and is equipped with poaching pan and boiling tray.



Hankcraft Co.
121 N. Lincoln St.

A Power Shovel on Crawlers, Which Travels from One Flat Car to Another and Quickly Unloads an Entire Train



POWER SHOVEL ON FLAT CARS
QUICKLY UNLOADS TRAIN

Carried on a train composed entirely of flat cars, a power shovel equipped with crawlers is used by a Long Beach, Calif., construction company to lift and shovel huge granite boulders into the bay where a breakwater is being built. After the removal of side boards and brake staffs from the cars, the shovel moves from car to car, dumping rocks weighing up to fifteen tons, although the shovel weighs only two and one-half tons more.

TYPEWRITER PRINTS MUSIC

After several years of effort an Italian composer has made a typewriter for composing music which he calls a "dactylo-musicograph." The machine resembles an ordinary typewriter, and is operated in the same manner. It types all kinds of music and is able to inscribe on the page either vertically or horizontally.

Wagner Herrero
may

Cont. Mel. Wharlock
709 Harmon League Bldg
San Francisco, Calif.

Kansas City Times
6/19/19

Made in Belgium by Stanley & Vertonghen
121 N. Lincoln St.
New York



Non-Sinkable Suit Enabling Flyers to Remain Afloat Three Days; Oval Shows Suit in Use, with Flag to Attract Attention and Breath Condenser Supplying Drinking Water

NON-SINKABLE AVIATOR'S SUIT FOR OCEAN FLYERS

Ocean flyers who meet with ill luck and are forced to make a water landing may keep themselves afloat for three days or more with a non-sinkable suit equipped with a breath condenser, to provide a supply of drinking water. The suit also has a red flag which stands upright when the aviator is in the water for the purpose of attracting passing ships.

SERIAL NUMBERS FOR BULLETS
- SO THEY MAY BE TRACED

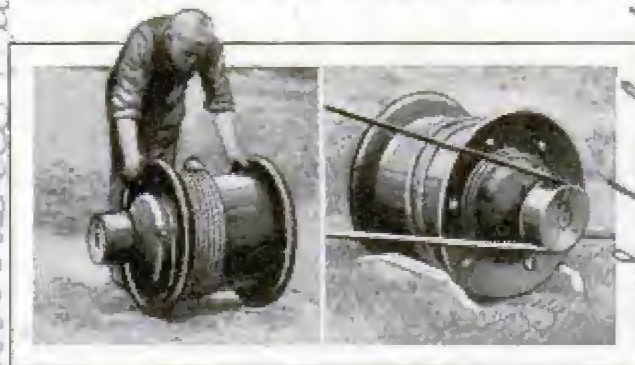
To aid in tracing the ownership of bullets that have been fired, a method of registering the leads in each cartridge has been devised. The maker stamps the serial number on the bullet and, when sold to the wholesaler, requires a receipt for the bullet of that number. The wholesaler in turn obtains a receipt from the retailer, and the individual buyer also acknowledges with his signature the serial number. Police officials, who have endorsed the plan, say that many murder cases could be solved if ownership of the bullets causing death could be determined, but admit that "bootleg" ammunition without the serial numbers probably would appear.



Eliminating the use of metal in making automobile tires puncture-proof, a tire engineer has utilized hard-rubber disks to form a section across the entire width of the tread. The puncture-proof unit is made up of a soft-rubber cushion into which are vulcanized disks of sufficient strength to stop a sharp object from penetrating the inner tube. The disks are arranged in superimposed position in the soft rubber, being imbedded so they do not work loose and do not interfere with the normal yielding of the tire. The

PORTABLE MOTOR INSIDE DRUM
114 4 IS EASILY MOVED

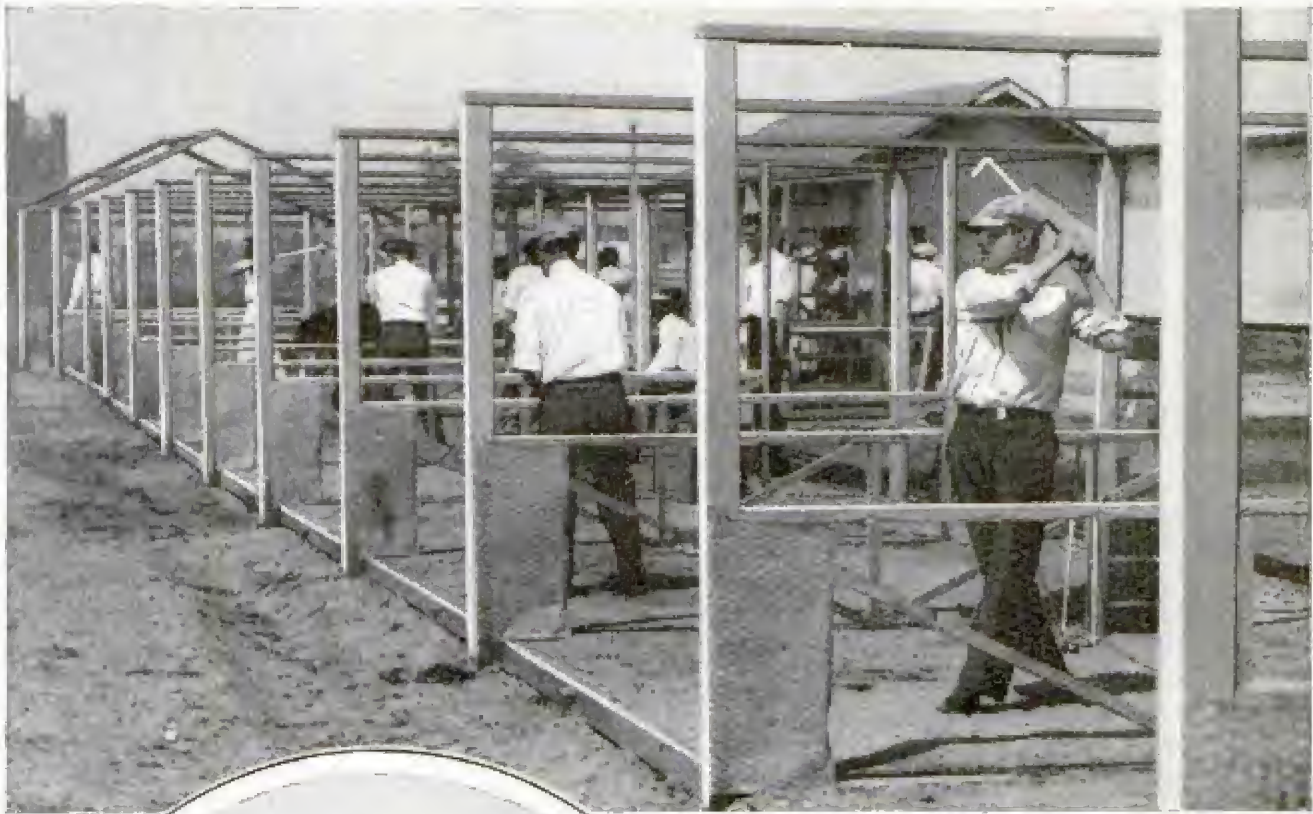
Inclosed in a water and dust-proof flanged drum, a portable motor for farm use has been brought out in Germany. On the drum is wound the supply cable which is connected to a power line, as farming in Germany is generally electrified with power available from numerous substations. In use the motor is simply



The Drum Contains a Portable Motor, Easily Rolled About and Blocked Up When in Use

blocked up and belted to the implement
to be operated.

ALL FUN AND NO WORK WITH PAILFUL OF BALLS



Above, a Practice Stand Where Golfers Rent a Pail of Balls and Drive Steadily for an Hour; Below, Retrieving the Balls, and the Pails Ready for the Next Enthusiasts

Practice stands for golfers to provide all fun and no work are popular along Chicago highways. Individual stalls are erected for the golfers at one end of a fairway. The golfer brings his clubs, pays from fifty cents to a dollar for the use of a stall for an hour, is provided with a pail full of balls and shoots to his heart's content, forgetting about the ball after he

hits it. Managers of such stands say that few golfers stay the entire hour, tiring more quickly than they expected. During intermissions caretakers retrieve the balls. On one such course, 400 feet long, 12,000 balls were driven in one day. The arms and wrists quickly become tired, golfers have found, when they try to drive continuously for an hour.



Flying

flivver roadster and tooling a ten-ton truck down the highway. Anybody who can drive the truck is competent to drive the flivver, but a lot of flivver chauffeurs would come to grief with a ten-ton juggernaut.

When the government took over control of flying and established license requirements, it was decreed that a pilot must have 200 hours in the air and pass stiff physical and technical ex-

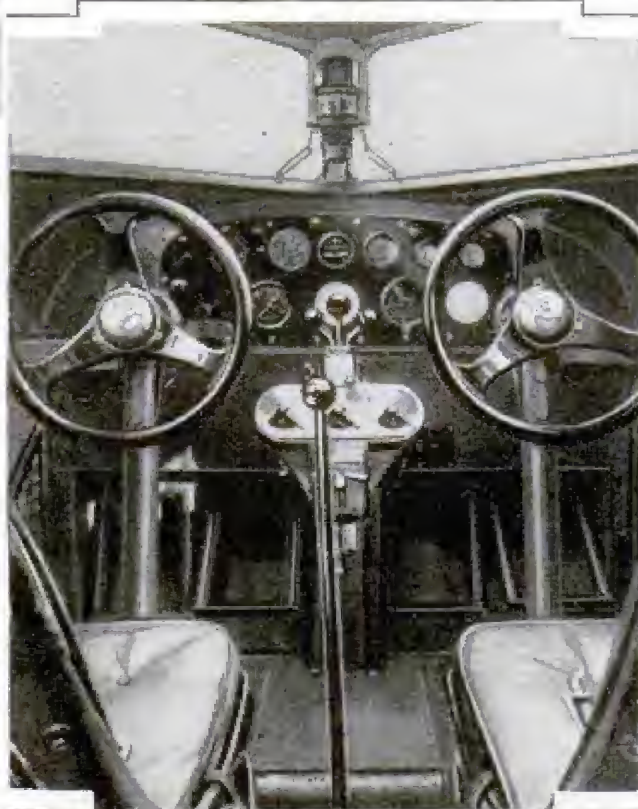
"Winding Up" to Start a Motor and View of the Dual Controls in a Tri-Motor Plane

By J. EARLE MILLER

A BIG Ford tri-motored passenger plane, with pilot and mechanic in the cockpit and fourteen persons riding in the cabin behind them, trundles out across the flying field. The motors roar as the three throttles are shoved forward, the trio of tachometers flick around the dial to 1,600 revolutions, the ship's tail comes up as it picks up speed, and at sixty miles an hour it leaves the ground.

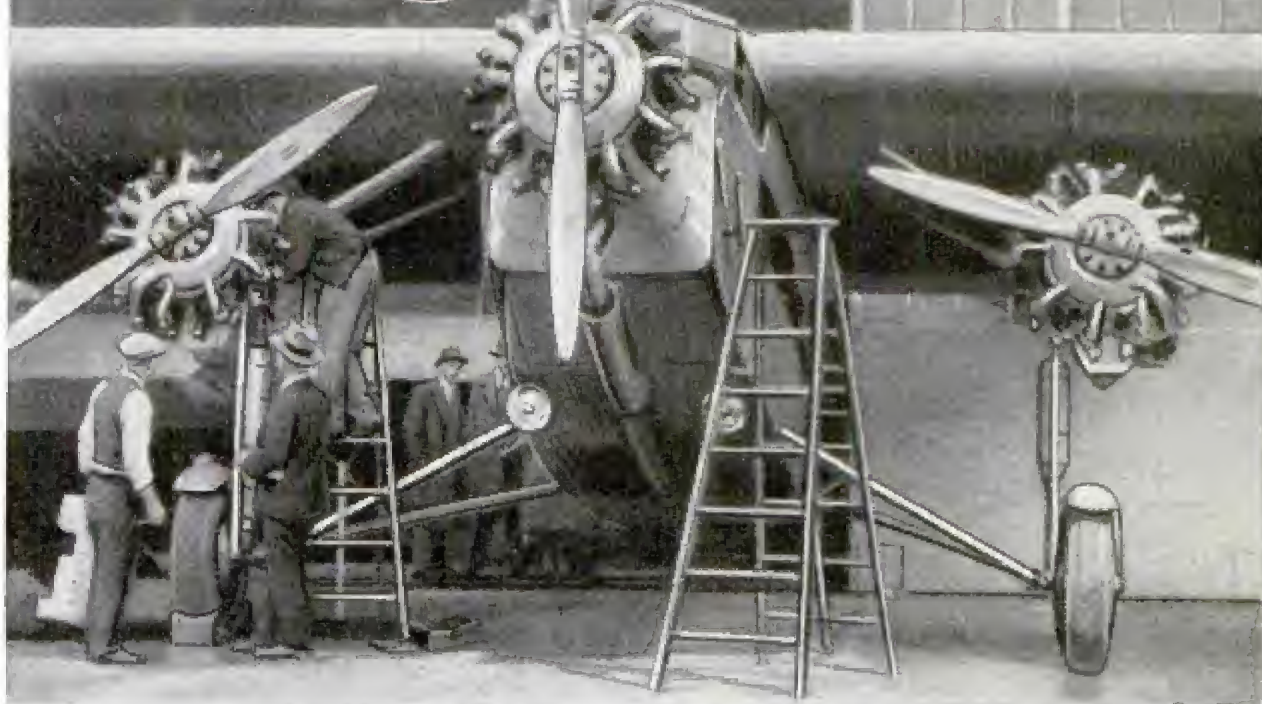
What, asks someone in the crowd behind the barrier fence, is the difference between flying one of those big transport planes and a little open-cockpit job? So, this is the story of how an air liner flies and is flown.

The difference between being the pilot of a privately owned sport plane and sitting at the controls of one of the big air liners is the difference between driving a



aminations before he could be licensed as a transport pilot, free to fly any ship anywhere and carry either passengers, ex-

the Air Liners



A Final Inspection before the Flight; Engineers Predict That the Tri-Motor Plane Will Be Largely Replaced in the Near Future by Ships with Four or More Engines

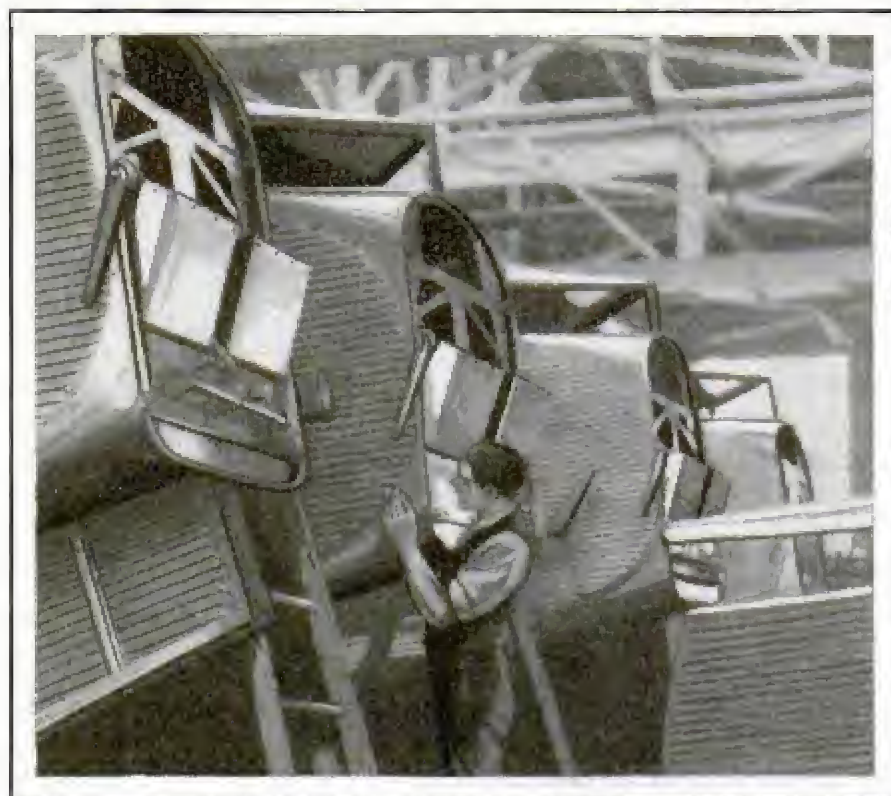
press, mail or freight for hire. Nothing was said, however, about the type of ship in which the 200 hours' experience was to be gained, and, in effect, a pilot who had 200 hours at the stick of a Heath "Parasol"—the smallest sport plane built in America—got the same kind of license as the man who had 200 or 2,000 hours at the controls of a big passenger liner. The only difference in their rank was that, when they applied for work, the air-line operators hired according to the applicants' experience and abilities.

Now all that is to be changed, for the aeronautic branch, department of commerce, is preparing to issue at least four grades of transport licenses for pilots who have flown small ships, medium-size planes, bigger ships, and the biggest ones. And the new regulations also will require a certain amount of night flying. About the only thing that will not be required, for the present, is "blind" flying through clouds and fog, and as soon as experiments, now being conducted in conjunc-

tion with the Guggenheim fund for the promotion of aeronautics, are completed, it is probable that that, too, will be added. The German Luft Hansa air lines already require every pilot to fly several hundred miles between two cities, with windows covered, so that only the compass can give the course and only the flying instruments can be used to keep the ship in level flight.

Outside of greater weight, higher take-off and landing speed, and a difference in gliding angle, the big transport planes fly very much like their smallest brothers. Most of them, because of their size, use the Deperdussin wheel control for ailerons instead of a stick. In the smaller ships, a movement of the stick forward or back changes the angle of the elevators at the tail and causes the ship to dive or climb, while a movement of the stick to either side raises one aileron at the wing tip and lowers the other, banking the ship for a turn.

With the "Dep" control, the stick still



Along the Assembly Line at the Stout Metal-Airplane Factory, a Division of the Ford Motor Company

moves fore and aft to work the elevators, but a wheel, like an ordinary automobile steering wheel, is mounted at the top of the stick and the aileron controls are attached to it. The wheel, because of its size, gives greater leverage in moving the long ailerons of a big ship with enormous wing spread, and, because it makes it easier to fly with both hands, enables the pilot to exert more force with less energy consumption—an important factor in bumpy air.

How does it feel to take off and fly one of the big multi-motored planes? The novice who has trained in smaller ships with the usual stick control, finds several things radically different. For one, in the big transport liners, such as the Fokker and the Ford, his seat has moved up in the nose and much higher from the ground—a momentous change because he must accustom himself to a new point of view in landing, and, with a faster ship, coming in at eighty miles an hour and landing at sixty, accurate judgment of distance is necessary to level out at the right moment and set several tons of plane down in a perfect three-point landing.

The instrument board, too, has changed. If the ship has three motors, there are three oil-pressure gauges, three tempera-

ture recorders, three tachometers and three ammeters to watch, and three throttles to handle instead of one of each. Rudder pedals haven't changed, but auxiliary brake pedals have been added to them, and, if he has never flown a ship with brakes, the pilot must learn to use them to turn the ship in taxiing it on the ground, and to check its speed, if a short field makes a quick stop necessary.

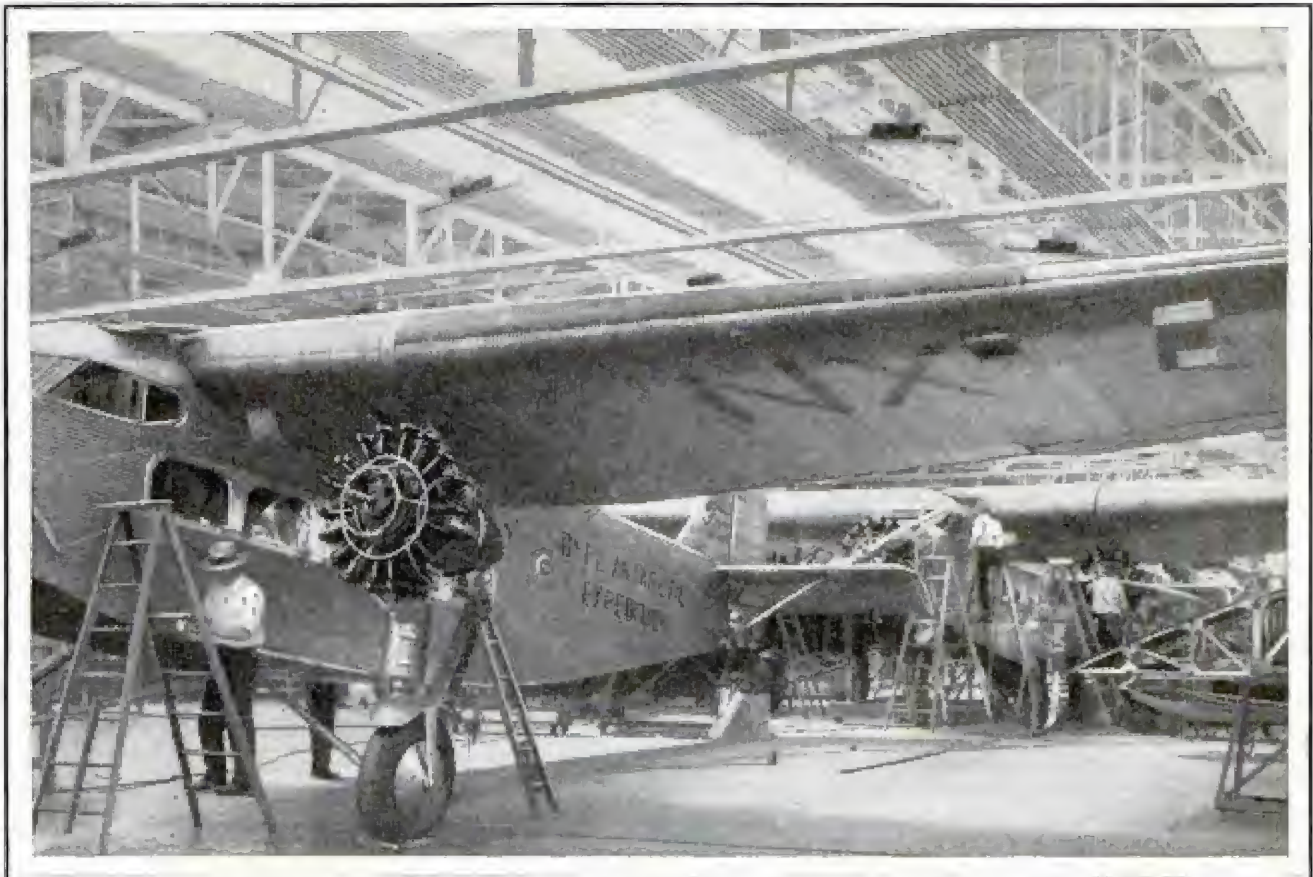
The higher take-off speed, sixty miles or better in most of the big ships, as compared with forty in the small training and sport planes, requires a longer run, but, aside from that, the big

liners are about as easy to handle as their smaller relatives. The pull of two or three propellers and the rush of wind at the higher speed over the tail surfaces make it practically as easy to shove the wheel forward and get the tail up into flying position, and, with speed attained, the wheel can be eased back and the ship, as pilots say, "flies herself off the ground."

Most monoplanes—and virtually all big passenger ships in America are monoplanes—are somewhat tricky on the controls, but this tendency, which is marked in the small two to four or six-passenger ships, is offset in the bigger weight carriers by the enormous wing spread necessary to lift a load of more than a ton and a half of passengers and baggage. It is virtually impossible to put one of the big ships into a spin, the most dreaded of aerial maneuvers.

Along with their greater wing spread, they have correspondingly larger control surfaces, and the longer ailerons, together with the leverage of the "Dep" wheel, make it easier to keep the wings level, or to bank for a turn, than in many of the smaller planes.

Landing a big liner, though, is markedly different from landing a sport plane. The pilot who has been accustomed to



Finishing One of the Big Ford Ships for the Byrd Expedition; Constant Developments in Aluminum Alloys Have Produced a Metal That Is Extremely Strong and Durable in Any Climate

diving in over the tree tops, "fish-tailing" his ship to lose flying speed, and then setting it down within a few hundred feet of the boundary line, is in for a surprise. Monoplanes, regardless of size, have the reputation among pilots of "floating forever" when gliding in for a landing. This is true whether the ship is a little three-passenger cabin job, such as the Curtiss "Robin" with its ninety-horsepower OX-5 engine, or one of the big tri-motored craft with space for fourteen to twenty passengers and more than 1,200 horsepower in its three engines.

A plane cannot be forced to land faster than its rated landing speed, for that speed is the one point where the air ceases to sustain its weight. If the flying speed is ninety or a hundred or 120 miles an hour and the landing speed is sixty, the excess, plus the speed due to its descending glide, must be lost before the wheels and tail can be set down on the field. The only way to lose it is to extend the glide, and that explains why the big liners get back a couple of miles or more from the field to start their glide. The careful pilot cuts his engine speed down to the point where the pull of the motors, plus

the effect of the glide, totals eighty miles an hour air speed, and holds it there until the ship is over the border of the field, a hundred feet or so off the ground. The last twenty miles of speed and the last hundred feet of altitude are quickly lost.

One trick the pilot of a multi-motored ship must learn is to keep his engines turning up to the same speed. A wing engine running faster than its mate has a tendency to turn the plane, a tendency that can only be corrected by carrying considerable opposite rudder. Because of the smallness of their dials, the inertia lag of the needles and their vibration, due to the motors, it is impossible to get a correct tachometer reading within ten or twenty revolutions. What the instruments fail to supply, the ear fills in, however, for it is possible to keep two or three motors in step as easily as one tunes out interference on the radio.

Unless the exhaust roar of the engines synchronizes, so that the explosions come together, there is a lack of resonance that manifests itself in a pounding sound, easily detected. Moving the throttles until the pounding fades out puts the engines in step.

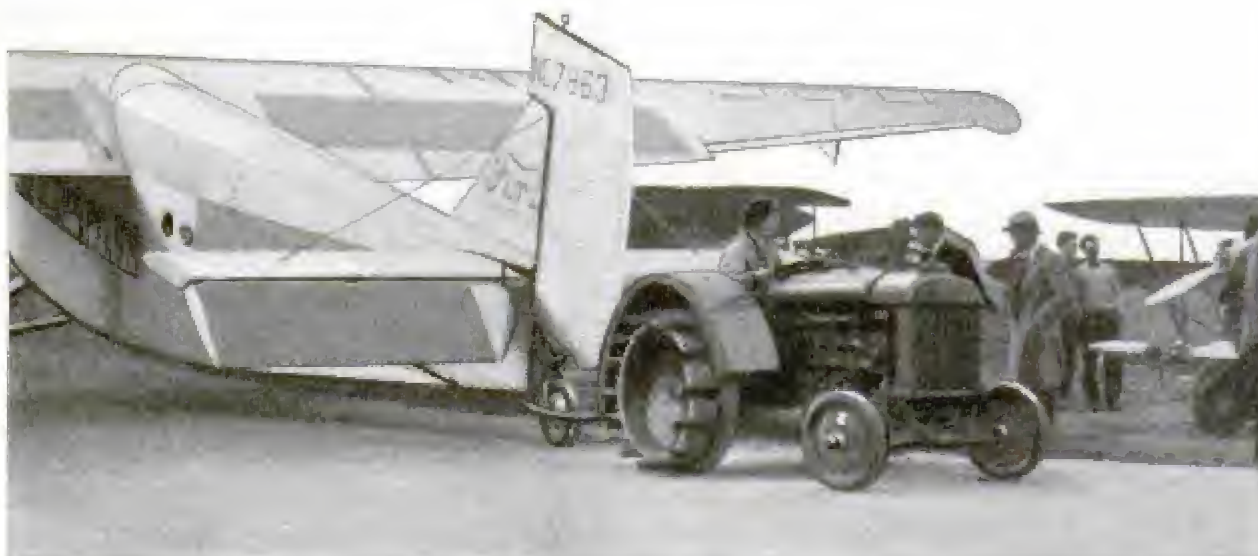


Being the "Skipper" of a Tri-Motor Transport Plane Is One of the Best Pilot Positions Aviation Offers Today, and the Demand for Competent Men Is Increasing

There is a good field for pilots capable of flying the big ships. When Transcontinental Air Transport was getting ready to establish its combined rail and air route across the country, in conjunction with fast trains on the Pennsylvania and Santa Fe, Maj. Tom Lanphier, in charge of operations, announced that, of more than thirty pilots needed, he had been able to

sign up but seventeen whom he regarded as of sufficient experience to fly passenger liners. To fill the other places he engaged junior pilots, to fly under the supervision of the seniors until they too had qualified for ranking positions.

Most of the air-line pilots at the controls of the big Fords, Fokkers, Sikorskys, Loenings, Keystones and similar



The Big Ships Fly, but It Sometimes Takes a Lowly Tractor to Pull Them In; Pilots of the Stout Air Lines Learn How to Care for Their Planes and How to Build Them

ships, have 2,000 or more hours of experience. To get 200 hours—the minimum requirement for a transport license—costs \$4,000 or more, but even before that time, the pilot who can afford to buy his own ship can begin to make money by barnstorming for joyride passengers, which he is permitted to do on a limited commercial license after fifty hours of solo flying.

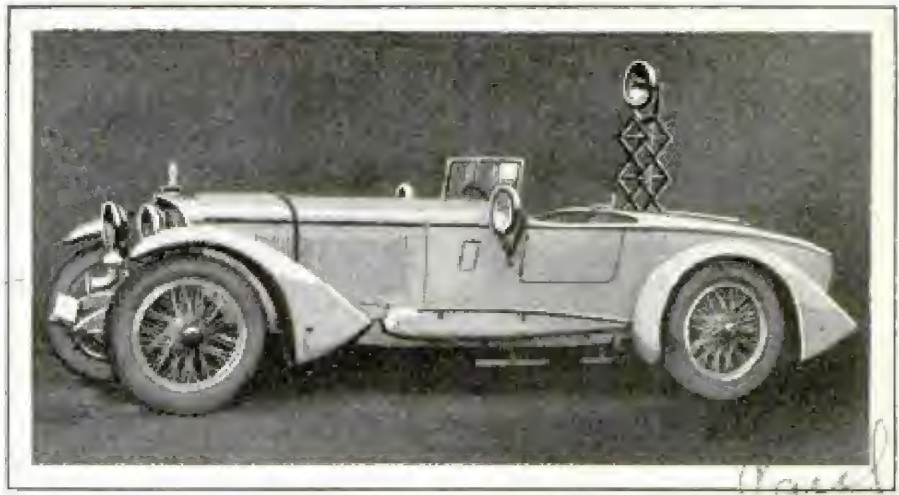
Several novel plans to enable young pilots to work up their time for the big ships have been considered or put in operation recently. Some of them will be described next month in a continuation of this article, which also will describe the flying of the smaller cabin ships.

(To Be Concluded)

MAGIC "SLEUTHS" SHOW STRAIN ON RAILS AND BRIDGES *2974*

How much does a concrete stadium sway and vibrate under the weight of thousands of rooters at a football game? What and where are the strains on a bridge as a heavy train thunders over it? As a passenger train roars at eighty miles an hour along the rails, what happens to the track bolts? These, and many other important questions, are answered by an efficient electric "detective" hidden away at a point where the stress is to be measured. It is known as a telemeter and is now extensively used in studying strains and stresses under actual operating conditions. The result is recorded on a strip of photographic film. Telemeters are mounted in the cockpit of an airplane to register the strains in all parts of the ship during flight; they are likewise adapted to automobiles, naval guns, elevators and structures of all kinds. They have been especially useful on concrete and other dams. They can be buried deep inside the material and, since they register conditions that could not be seen by the eye, are valuable in revealing displacements or strains that might result in breaks. Freight cars are being tested with them.

Francis L. Tatnall
Wm. Washington A. Co.



A Maharajah of India Goes Hunting in This Streamline Car, Equipped with Powerful Searchlights to Help Spot Game

SEARCHLIGHTS ON HUNTING CAR HELP RAJAH SPOT GAME *of Bhopal*

Five powerful searchlights have been mounted on a streamline automobile to aid a maharajah of India in spotting big game when he goes on a hunting trip. The hunting car has an extension light rigged up behind the driver's seat and four other searchlights ranged along the front, to spot or confound the tiger or other game the rajah's party is hunting.

MERRY-GO-ROUND FOR HOME OPERATED BY CHILDREN *3127*

Accommodating four children who provide the motive power themselves, a merry-go-round for the home is giving the youngsters loads of fun. It may be placed in the house or outside and is operated by levers, similar to those on hand



Children Operate the Levers to Furnish Motive Power for This Indoor Merry-Go-Round

cars, each rider pulling one. The speed is governed by the pull of the rider.

Yager Shuk
Metal
Pl. 5, 1st



Driving a Saber through a Target as His Mount Clears a Barrier Is the Difficult Feat Accomplished by This English Cavalryman

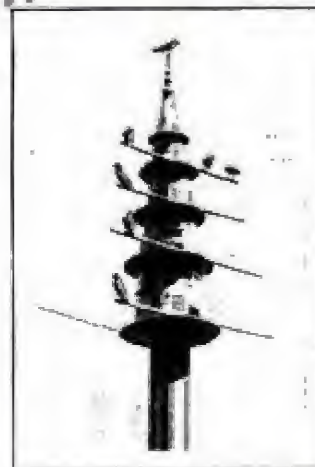
CAVALRYMAN PIERCES TARGET AS MOUNT LEAPS BARRIER

Swordsmen of the English cavalry are being trained in the difficult feat of jumping a horse over a barrier and thrusting simultaneously at a target with their weapons. Both horse and rider must prove their mettle in order to time the mount's jump and the thrust of the sword so that the weapon plunges home in the target as the horse leaps the obstacle.

SHIFT IN RADIO-BEACON WAVES REVEALED BY INDICATOR

To give warning when radio-beacon waves directing airplanes shift from their fixed course, an instrument known as a course-shift indicator has been devised for installation on switchboards in beacon stations. The appliance indicates instantly to attendants whether the beacon is being maintained in a fixed position and also may be used on aircraft as a course indicator. The needle of the instrument remains in the center of the scale when the plane is in the middle of the radio beacon course, but moves if it deviates.

APARTMENT HOUSE FOR BIRDS BUILT LIKE SKYSCRAPER



five platforms with a two-story apartment above each platform, the skyscraper being built with setbacks and a spire like the modern city structure.

NEW PLANT YIELDS THREE VALUABLE PRODUCTS

Brotex, a plant evolved by an English scientist, yields three valuable products which agriculturists say may result in its extensive cultivation with benefit to farming. It grows from seed and in its early stages, resembles the ordinary cabbage, but is a slow grower and takes from twelve to eighteen months to attain maturity, when it is from eight to ten feet high and has a stem of some ten inches in diameter. It yields fiber for textiles, wood cellulose from its core for paper making, and seed for the manufacture of cattle food. It

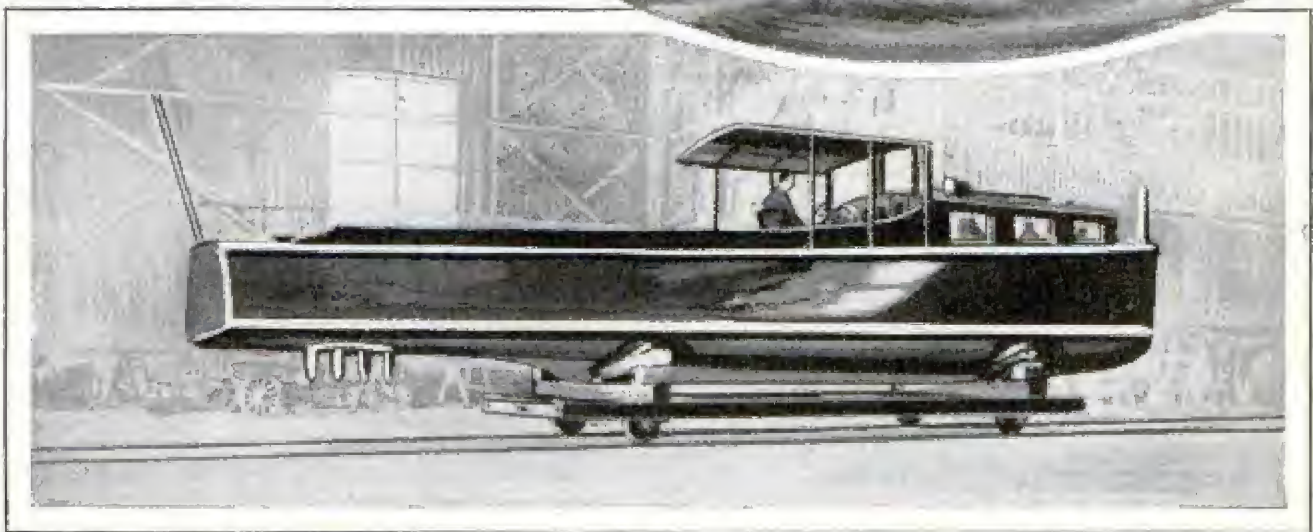
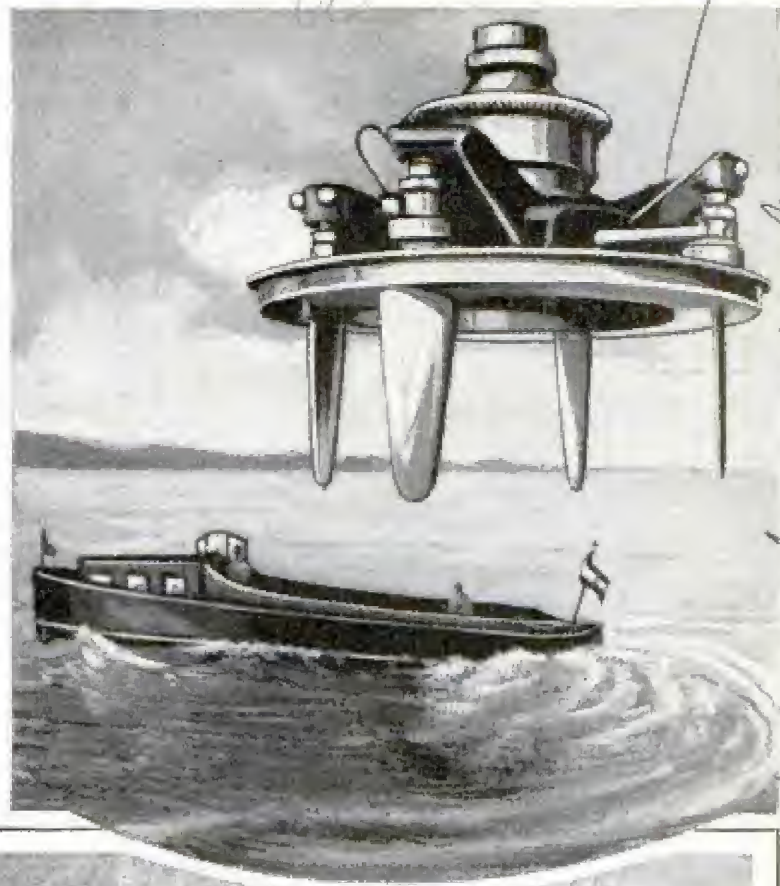
also can be planted in the spring and harvested in the fall for its fiber alone. When matured, the yield per acre is about a ton and a half of fiber, five and a quarter tons of wood and two and one-half tons of seed. Profit from the crop has been estimated at about \$250 an acre.

Bureau of Standards

J. L. Hunt

PROPELLER AND RUDDER COMBINED ENABLE QUICK STOPS

Functions of a screw and of steering apparatus are performed by an improved propeller introduced in Germany. Four blades are arranged on vertical axes upon a rotor which is also on a shaft, vertical with respect to the boat. The blades or scoops have a swinging motion, due to their mounting, and by means of an auxiliary motor inside the propeller, their pitch can be changed in such a way that they serve as rudders to guide the craft. According to reports of a test run of 600 miles, a boat equipped with this propeller was stopped from full speed ahead in less than its own length.



Close View of the Propeller, Drawing of Boat Making a Sharp Turn with Its Aid, and How the Propeller-Rudder Combination Looks When Installed

REPAIRING OLD OCEAN CABLES

Repairing ocean cables, although a highly developed profession, still is a job where the fates, in the form of sea and weather, play a hand. Frequently ships grapple for days for cables reposing in the soft ooze of the ocean bottom, and if the sea becomes rough, mark the position with a buoy moored by anchor to hundreds of fathoms of line while the ship rides out the bad weather. Even after the ship has made a successful grapple, the job

is far from finished, because the slightest error in judgment will cause the cable to snap as it is raised, particularly if it is an old one with armor wires worn and corroded. The raising of a cable twenty-five or thirty years old is so delicate a task that movement of the 2,000-ton ship a few feet one way or the other may spell success or failure. Strain on the cable as it is raised is constantly watched aboard ship on a dynamometer. A sudden lurch of the ship often undoes the work of weeks in a few seconds.

Western Union Cable Co.
195 Broadway

Vien na engine near
Built by J. M. Voith

Heidenheim
ad Brenz.
J. M. Voith Maschinen-fabrik
St. Colten, Niederosternich

lots and slashes
no. 7 July 1919



Operator Using a Smoke Tank to Conceal Important Buildings from View of Aerial Enemy

SMOKE SCREEN FOR BUILDINGS PREVENTS AERIAL ATTACK

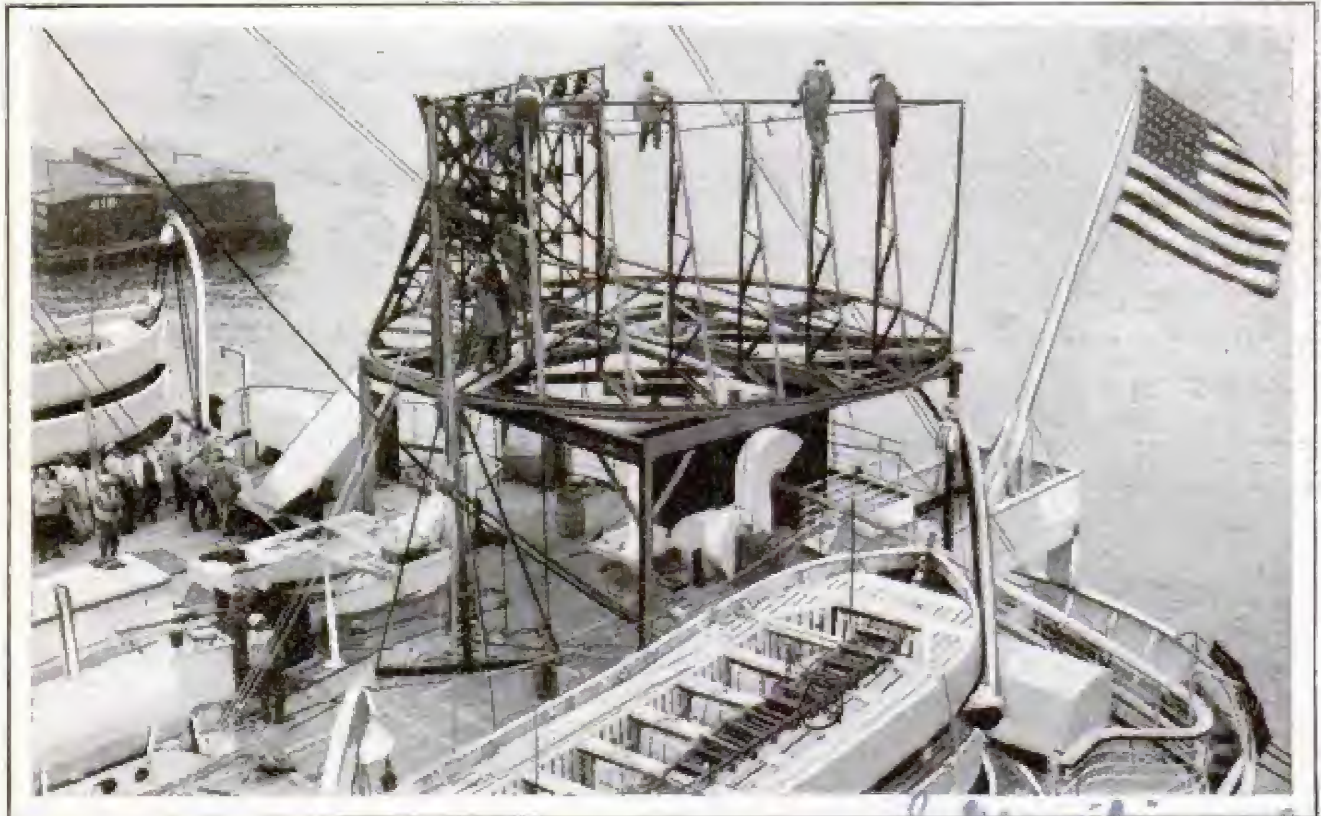
Experiments are being conducted in Germany with a type of smoke intended to lay screens about important industrial and commercial centers to guard against

aerial attack in time of war. Aside from its official status as a defense precaution, attempts also are being made to convince owners of important industrial plants that they should provide their establishments with tanks of smoke for the purpose of foiling a surprise aerial attack just as they provide fire extinguishers.

PLANE USES HOOK AND LINE TO SPEED OCEAN MAIL

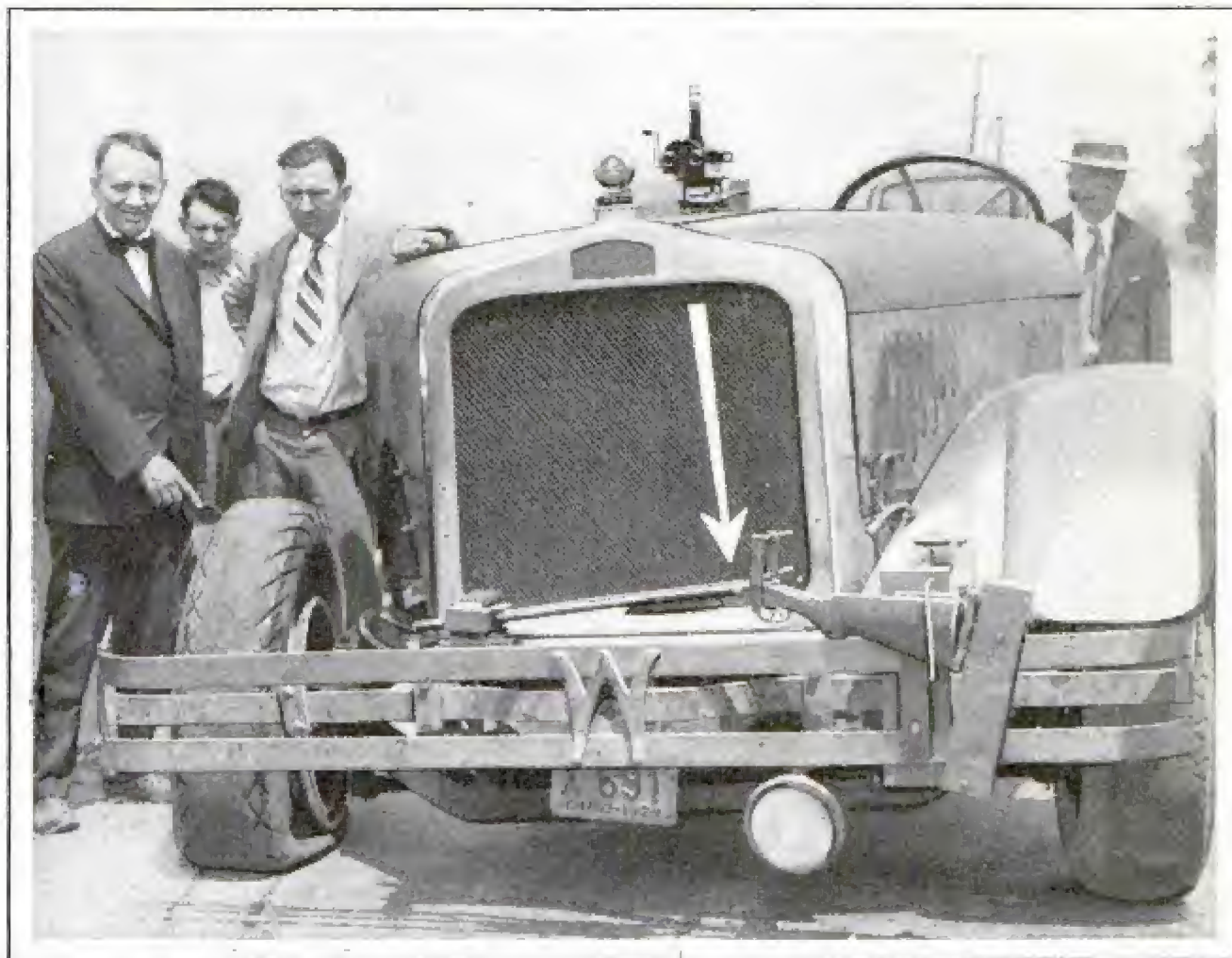
2954

Three-day mail service between Europe and the United States will be made possible by equipment installed on the "Leviathan," which enables an airplane to snatch mail from the ship's deck with a hook and line. The ship's equipment consists of a steel contrivance that serves as an alley guiding the hook to the mail bag which is attached to a wire stretched between two stanchions. The pick-up line is a wire attached to the plane's fuselage. At the end is a three-pound ball and a three-pointed hook. The ship's direction is regulated so that the plane, flying about 200 feet overhead, can face the wind and thus reduce its speed while the pick-up is accomplished. The plane is to meet the ship regularly about 600 miles at sea.



Workmen Are Here Shown Erecting the Runway or "Alley" on the Deck of the "Leviathan," from Which an Airplane Snatches the Ship's Mail While the Craft Is 600 Miles at Sea

WHAT HAPPENS WHEN A FRONT TIRE BLOWS OUT?



This Blowout Was a Complete Success; the Shotgun Was Arranged to Burst the Tire to Determine What Happened When a Tire Blew Out on a Bus Going Sixty Miles an Hour

What happens to a passenger bus traveling sixty miles an hour when a front tire blows out? A bus-manufacturing company wanted to know, but each time a blowout was arranged the tire deflated so slowly that engineers were unable to judge the effect. Finally a shotgun was rigged on the front fender, its muzzle pointing at the tire and its trigger operated by a cable behind the driver's seat. The gun was fired when the bus attained the proper speed and the tire deflated immediately, after which the bus ran 250 feet under braking without swerving from its course.

ZOO ANIMALS LIVE LONGEST

Investigation by zoo officials has disclosed that most animals live longer in captivity than in their natural haunts. This is attributed in part to the better care and feed the zoo animals receive, as compared with those that forage for them-

elves. One official told of wild birds that frequented zoo cages where those of similar species were held, and even built their nests just outside the cages, apparently anxious to join the captives.

REMOVABLE PANE IN WINDOW ELIMINATES STORM SASH



Taking the place of the usual storm windows, a wood sash now on the market has a removable inner pane. This helps keep out dust and noise as well as cold, insures a frost-proof window, and the sash is so constructed that special frames are not necessary.

2862

*White In-car
Herald Tribune 9/11/19
Chicago
3868
Director National
Bird*

*like a star 4 6
Hilthman*

2744

With the Mystery



The great majority of commercial vessels sunk by the U-boats were sent down by gun fire, with the submersible coming to the surface and stopping its victim, ordering the people aboard to the boats and then opening fire with shells. It could not have been otherwise. Torpedoes are highly expensive engines. The element of cost is important. More important is the fact that, a submarine being a comparatively small vessel and a torpedo being a large missile, a submarine could carry only a limited number.

A special Q-ship section in the British admiralty directed the campaign of the mystery ships against the U-boats. Officers, crews and ships were selected. The men were the very best of the British navy—they had to be for the

By LOWELL THOMAS

Author of "Raiders of the Deep," "Count Luckner, The Sea Devil," and "With Lawrence in Arabia," etc.

THE SCIENCE of deception raised to the Nth power—that was the Q-ship. A falsehood, a whopping lie was developed with a technique complicated and ingenious enough to be worthy of some high branch of scholarship or mechanics. The Q-ship was an elaborate decoy set to trap submarines. Seemingly it was the most innocent of ships, usually an old tramp steamer. Actually it was an auxiliary cruiser armed to the teeth, with heavy guns, with depth bombs, often with torpedoes.

dangerous work, the "Suicide Club," as it was called. The vessels were sometimes windjammers, which had the advantage of looking particularly innocent; were independent of coal supplies, could stay at sea for indefinite periods, and had no engines to interfere with the use of hydrophones in listening for submarines. Tramp steamers, however, made the best Q-ships. A tramp could be armed heavily and could put up a stouter fight.

The state of things aboard the Q-ship was evidence indeed that "clothes maketh

Ships



Tramp Steamship, Converted by Skillful Camouflage into a Mystery Ship, to Decoy German Submarines to Their Doom; This Q-Vessel Was Named the "Lothbury"

the man." The officers, when ashore, were among the smartest and best turned out of all the British navy. The mystery-ship crews were crack seamen, disciplined to the minute, picked men from the Grand Fleet. But if you could have stepped aboard a Q-ship, you never would have suspected it. No natty uniforms, no crack discipline, no saluting, no trim navy appearance anywhere. Instead, you would see a crew as villainous-looking as any that ever sailed the seven seas, unshaven, clad in hand-me-downs, disorderly and dirty. One Q-ship commander wore a false mustache and dressed as if he were a commercial traveler aboard the tramp. Another paraded the deck in a flaxen wig and squat hat—what submarine commander would take him for anything save a Dutch pilot? A favorite ruse was the lady aboard, a sailor dressed up in the kind of feminine finery you would expect on such a craft.

If the old tramp was originally filthy, it remained so. If it was too clean, it was dirtied a bit. The guns were cleverly concealed behind flaps that could be let down at a moment's notice. The hiding of the guns was, of course, the all-important thing, and they often were so neatly tucked away that they could not be seen from the tramp's own deck. On many a Q-ship, a casual visitor might be shown around and never suspect he was aboard a decoy fighting craft.

There were various devices to fool the U-boat. One Q-ship could produce a good

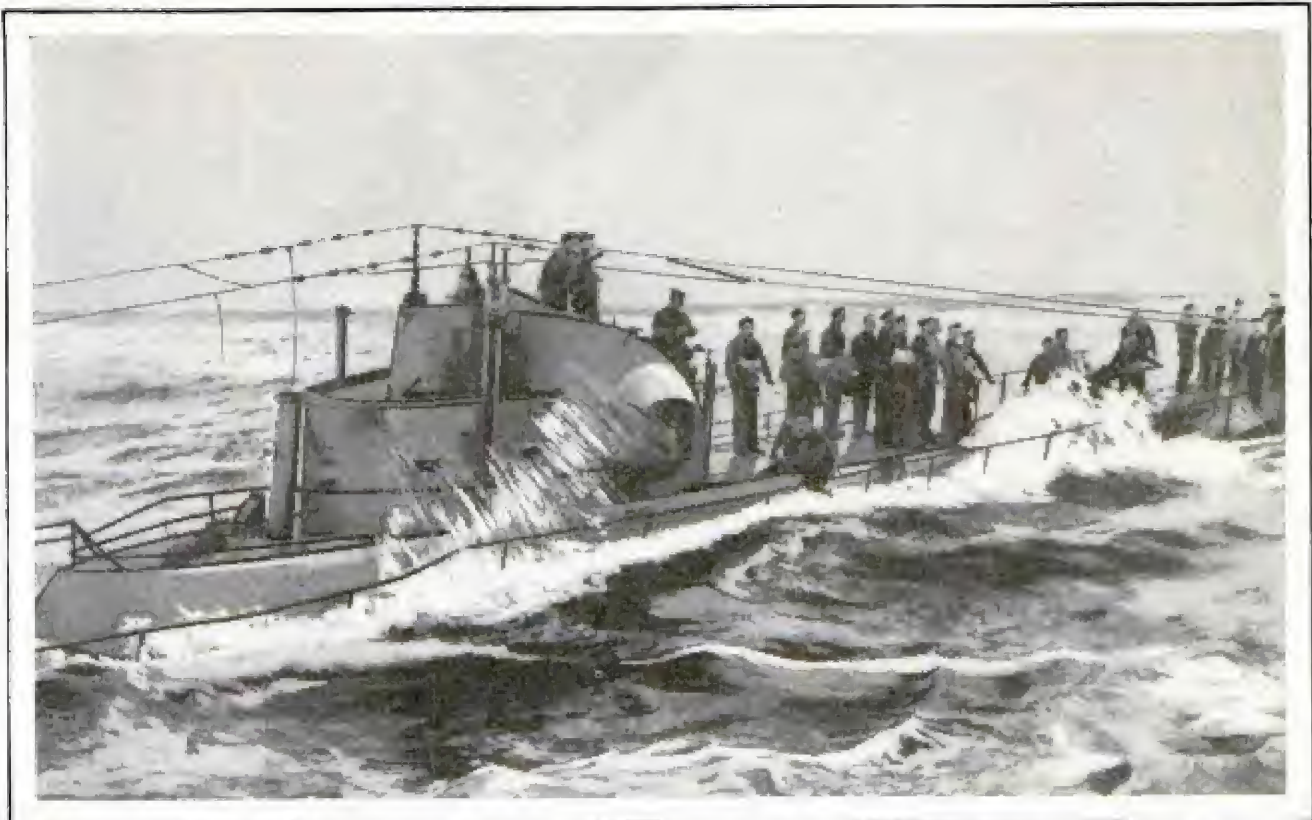
imitation of a shell exploding on deck, to make the submarine captain believe he had scored a hit with his gun. Another would blow off steam to pretend that her boilers had been hit. Sometimes a side of fresh beef would be hung in conspicuous sight. The Q-ship skipper, who perhaps had served in submarines himself, knew that aboard underwater craft canned food is the rule, and how tired men get of it. The U-boat officers were always boarding captured ships to pick up fresh provisions, and a side of fresh beef in plain sight was sure to be well-nigh irresistible bait.

The U-boat commander was not officially credited by the German admiralty with sinking a ship unless he could report its name and particulars. Bringing back the ship's papers was excellent proof, for instance. Sometimes the submarine would send a boarding party on a captured vessel, but more often the U-boat commander would get information, and, if possible, papers, from the crew after they had taken to the boats. A U-boat would order the crew of the supposed tramp to the boats, and part of the crew would take to the boats as if it were the real thing. This act was elaborately staged, with every detail as correct as in an expensive London theatrical performance. Those who carried out this part of the hoax were known as members of the "panic party." And while they were making off, the rest of the crew would remain hidden aboard the apparently deserted vessel, ready to open a sudden and unexpected fire as soon as the

29 K4



"A Fast Convoy." One of a Series of Paintings by Burnell Poole, Presented to the Naval Historical Foundation by the E. I. Du Pont de Nemours Company and on Exhibit at the Naval Academy



Capture of the "U-58" by the U. S. Destroyer "Fanning"; This Was the First U-Boat Taken by the United States in the World War

submarine would come nearer to question those in the boats.

In the first part of the Q-ship campaign, the U-boat commanders were quite unaware of the trap the British had prepared for them, and more than one unfortunate submarine commander, when about to send what seemed to be an easy victim to the bottom, found himself in the position of Rastus who, while fishing, found an alligator on the end of his line and asked himself, "Is dis nigger fishing, or is dis fish niggering?"

But, of course, the first U-boat to escape from an encounter with a Q-ship returned to Germany and spread the alarm. Thereafter every merchant vessel was handled gingerly, as though it were a potential Q-ship. From then on, the Germans made it a rule to approach a ship either from dead ahead or astern, where guns, if there were any, could not be brought to bear. They also shelled each apparently deserted ship from a range comparatively safe for them, and rarely came close until they had first searched their prospective victim with many shells. This diminished the effectiveness of the Q-ships, but, at the same time, made the game all the more exciting and brought about some of the greatest fights that have ever been staged on the sea.

It soon got so a Q-ship would not drop its disguise and open fire until it had been raked with shells and appeared almost ready to sink. This scheme meant that special methods were devised so as to keep afloat even when it might look to the U-boat people as though the tramp were doomed. The Britishers stowed their holds with barrels, or buoyant lumber, stuff that would keep them up long after they had been torpedoed or thoroughly riddled by shell fire. Then the battle would be on and often it was a case of a battered derelict suddenly coming to life for a grim struggle with the attacking submarine, sometimes to lose, sometimes to win, sometimes to lose while winning—for there were instances of a riddled Q-ship sinking after having dispatched its adversary, the submarine.

The first encounter between an Allied mystery ship and a German undersea raider occurred in July, 1915, when the "Prince Charles," in the guise of a loafing old coal ship, met the "U-36," which submarine, as it happens, had a certain small historic interest and a considerable interest to me personally. In my book, "Count Luckner, the Sea Devil," I told the tale of the jolly seadog count who took a sailing ship raider through the British

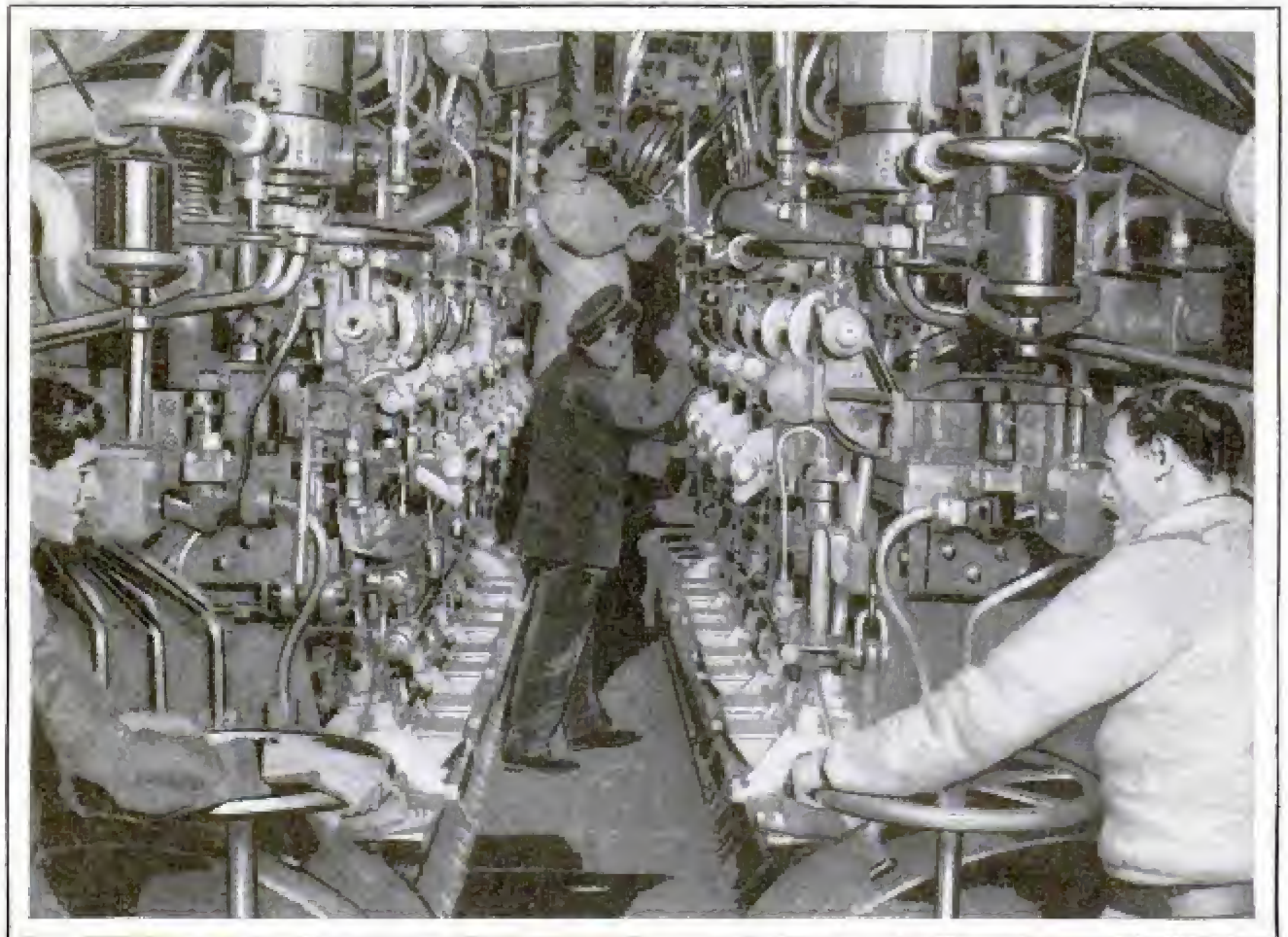
blockade and went buccaneering on the seas, sinking Allied ships. The old wind-jammer that he took was a former American-owned clipper ship which the Germans had captured. She had been picked up in the North sea by a submarine and brought into port. The undersea craft that made the capture was, precisely, the "U-36," which, not long after daybreak of a bright July morning in 1915, sighted what seemed to be nothing more than a grimy, slovenly collier, but in reality was a deadly trap.

The German had just stopped another ship, and was preparing to sink it. "Why not make it two fish at one cast?" we can hear Herr U-boat Kommandant say to himself. So the "U-36" heads toward the collier. "Abandon ship"—and a shell cuts across her bow to enforce the order. Panic party, and men aboard the collier take wildly to the boats. Then the submarine begins to bombard the collier to sink her, slowly closing up so as to waste fewer shells. Aboard the "Prince Charles," Lieutenant Wardlaw and his gun crew lay con-

cealed with shells bursting around them. They wait until the "U-36" is within 600 yards, and then the collier drops her mask. Gun ports fall away. British Jack tars run up the war ensign while their comrades open fire with a deadly precision. The Germans on the U-boat's deck leap into their conning tower and the "U-36" tries to dive. But the Q-ship shells are ripping into her. She gets under water, but she's sinking. So they blow her tanks and she jumps to the surface again, right back into that rain of shell fire. The Germans are scrambling out of the conning tower as the "U-36" takes her final plunge.

The "Prince Charles" picked up fifteen men, including the submarine commander, out of a crew of thirty-three.

The second U-boat sunk by Q-ship attack provided an international sensation—the "Baralong" case. In August, 1915, the "U-27" stopped and prepared to sink the American steamer "Nicosian," which carried a cargo of contraband and was therefore subject to seizure. The Q-ship "Baralong," disguised as a tramp, came on the



At the Controls of a Submarine's Engine Room in War Time; in Restricted Spaces Such as This, Tactics That Played an Important Part in the Struggle Were Executed

scene as the "U-27" was shelling the abandoned "Nicosian." The submarine paid no attention to the disguised tramp until the "Baralong" had crept within deadly range. Down dropped the "Baralong's" flaps. A hail of short-range fire, and the "U-27" quickly foundered. A large part of her crew was on deck, and they were left swimming in the water. At this point the controversy begins. The Germans, backed by the statements of some of the people of the "Nicosian," hold that the crew of the "Baralong" lined the rail and shot the Germans in the water as they tried to swim to safety, and killed most of them, including the U-boat captain. The British deny this. There were diplomatic protests to neutral governments and a great deal of wrangling. To this day the affair is shrouded in mystery.

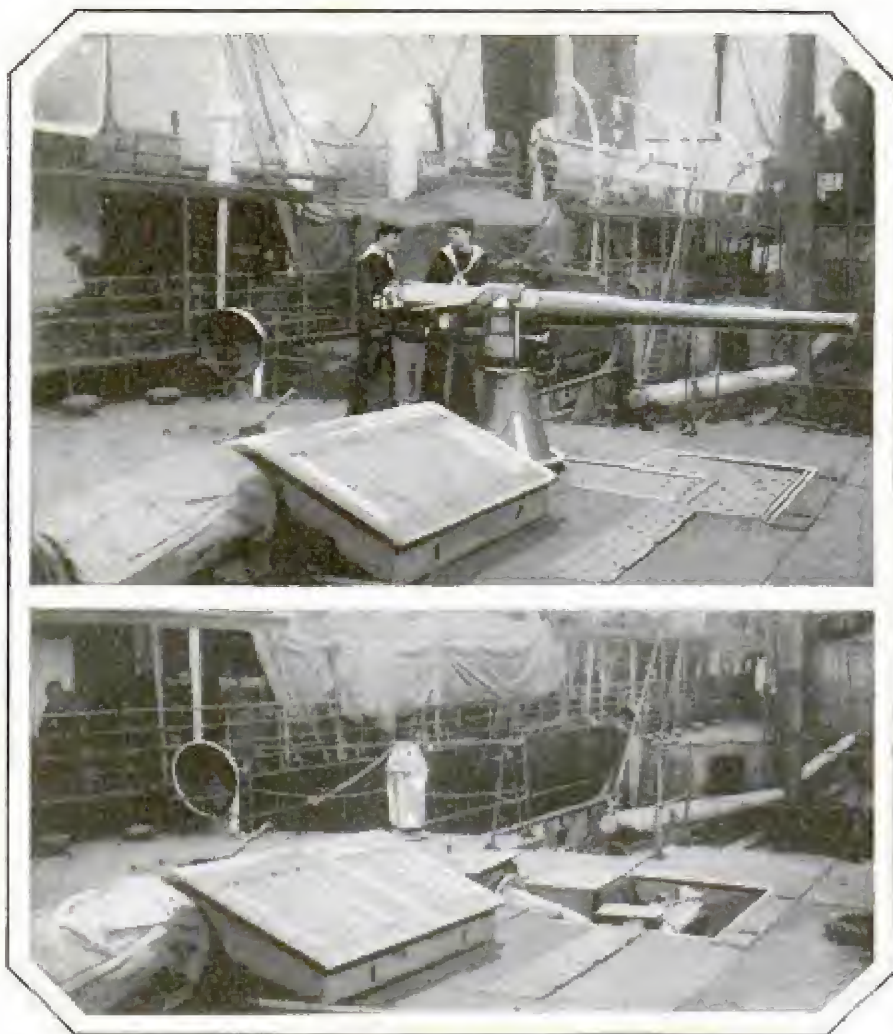
One of the memorable cases of a U-boat sunk by a Q-ship was that of the "U-88," which went down in May, 1917. The "Stonecrop," a small steamer rigged out as a decoy, under Commander Blackwood of the British navy, was attacked, pretended to run away and was heavily shelled. She set her smoke apparatus going, to make it appear as if she were on fire. These were times when the U-boat commanders were very cautious, and it took many devices to fool them. The "Stonecrop" seemed afire from stem to stern. The supposed crew had taken to the boats. The hidden gunners aboard waited an interminable time. The "U-88" lay off watching, at a safe distance. It was not until the "Stonecrop" seemed to be gutted with the fire that the undersea craft ventured close to sink her with a final few shots, and even then the



A German U-Boat Orders a Sailing Ship to Stand By for Torpedoing; the Crew Takes to the Boats

gunners aboard the Q-ship had to open fire at long range. Their gunnery was good, though. They hit the "U-88" squarely, and she sank with all hands. Her captain—and this held the deeper drama of the situation—was Lieut. Comm. Walter Schwieger, the man who sank the "Lusitania."

Not many months ago, I talked with Capt. Harold Auten, V. C., a paladin of the Q-ships, who, next to the famous young admiral, Gordon Campbell, ranks at the top of the list of Q-ship aces. He told me of his most exciting fight, and a desperate affair it was. It illustrates one of the cardinal facts pertinent to the campaign of the Q-ships—that these decoy craft often had a very bad time of it, and,



How Mystery Ships Concealed Quick-Firing Guns on Vanishing Platforms;
Gun Withdrawn in Lower Photograph

trap or no trap, found themselves in desperate corners.

At the end of July, 1918, the small Q-ship "Stock-Force," under Auten's command, was cruising along to the north of France.

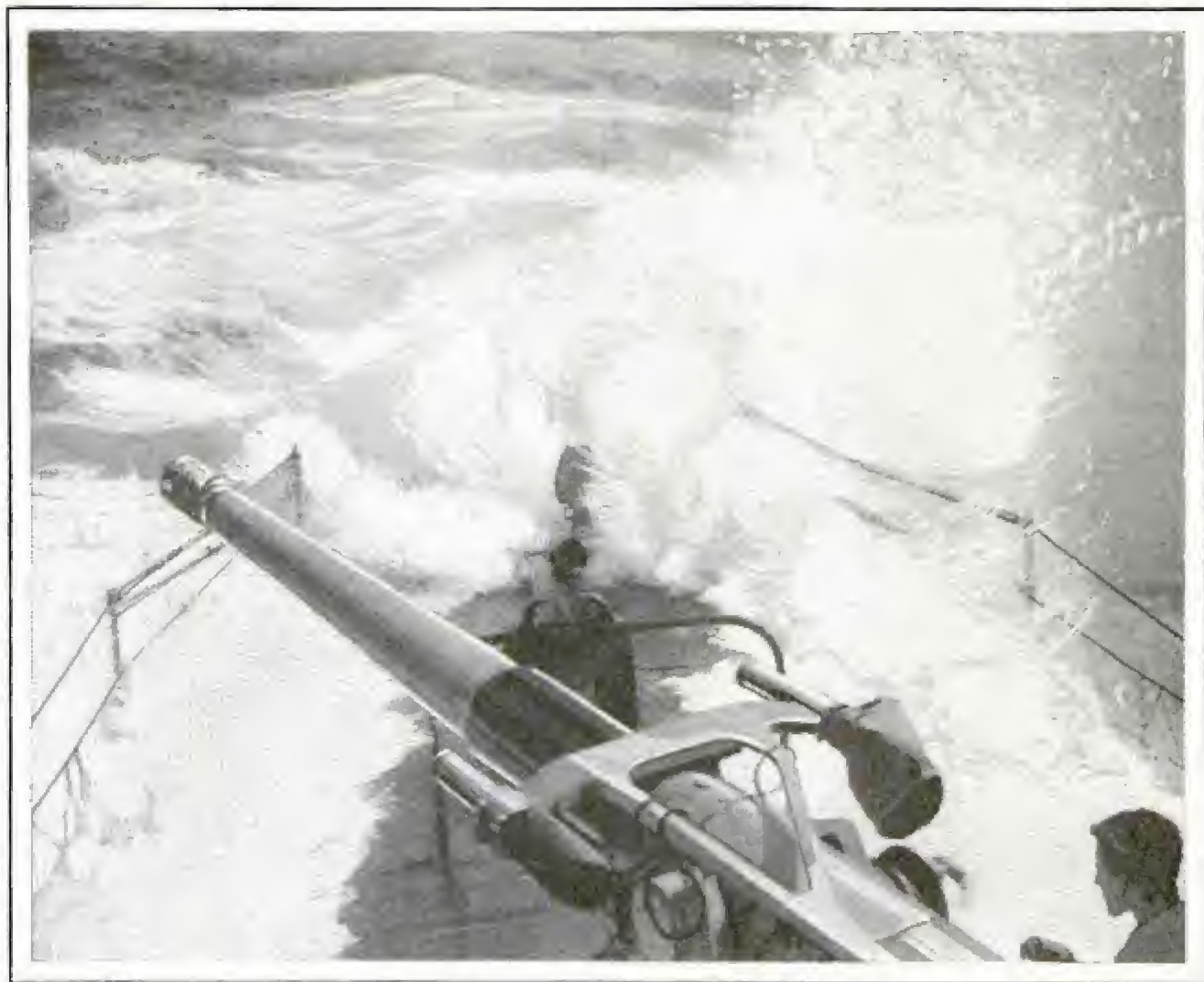
"At four in the afternoon," Captain Auten relates, "I was in my cabin playing a rubber or two of bridge with three officers off duty. A loud clanging, and the alarm bells were ringing. Cards flew in all directions as we dashed out. And there I saw a white streak on the water, the wake of a torpedo. Some devilish submarine out there must have suspected us of being a Q-ship, or he would not have wasted a torpedo on such a small craft. The torpedo hit us fairly. The 'Stock-Force' was only a hundred and sixty feet long. The explosion tore a hole, forty feet wide, clear through the hull from one end to another. You can't imagine such a terrific blow-up. I was on the bridge, and the bridge was entirely destroyed. I

remember describing a curve in the air, while my cabin table simultaneously landed on top of me. The foredeck was bent, the derricks blown overboard. The air was filled with debris, planks and beams and unexploded shells and a huge column of water, and all of that came down on us with a fearful clatter, wounding everybody. The chart table, which had landed on me, was on top of me and saved me. The men who were most shaken became violently sick.

"We were sinking, but the hold was crammed with wood, and that was keeping us afloat for a while. The guns fore and aft were intact, and capable of opening fire. There might still be a chance for a little fun, I thought. 'Panic party,' I ordered. And the men, nearly all of whom were wounded,

proceeded to stage a panic party. They were as cool as ice, and went through all the disguise maneuvers of the drill. These, together with the real havoc that had been wrought, made it surely the most realistic panic party ever staged.

"Aboard we waited, hidden at the guns. We could feel the 'Stock-Force' settling beneath us. How long would she last? And that U-boat was altogether too careful. He must have guessed we were a Q-ship, because, derelict as we were, he was not coming near to finish us with gun fire. We waited and waited. Every minute was agony for us and a few inches deeper in the water for the slowly sinking ship. Wasn't he ever coming up to finish us? Half an hour passed. No, he was going after the lifeboats. He was going to get his information from them. And now the lifeboats were rowing as hard as they could. They were drawing the submarine into the range of our fire. It was a long and tedious process. Every moment I was



Heavy Seas Breaking over the Stern of a United States Destroyer; in Spite of Storms, These Sturdy Craft Are Able to Make Fast Time

about to order the guns to fire, although the range was not good. I was afraid the ship would take a plunge under us, and then our chance would be gone for good. Then finally the lifeboats had drawn the submarine into as good a position as we could hope for.

"Stand by the guns; fire!" I commanded. The gun ports dropped away with a bang, and the fight was on.

"Our first shot carried away the periscope and the wireless. Good shooting—but we had to do good shooting. Our second hit the conning tower, and blew a man into the air. Another found the hull just below the conning tower. The stern of the U-boat began to sink. Smoke was pouring out of her. Evidently one of our shells had exploded inside of her. We continued to fire. Her bow was rising straight in the air, and she went down.

"The panic party came back on board. We hoped to be able to do something to keep the 'Stock-Force' from sinking. Some

trawlers, attracted by the firing, appeared. They tried to take the 'Stock-Force' in tow and beach her on the shore eight miles away. It was no use. The good old ship was sinking under our feet. We took to the boats, and down she went."

Auten got the V. C. for this exploit. Then, after the war, a curious thing was discovered. The U-boat, which was last seen sinking, stern first, had got back to Germany. Her crew had been able to right her under water, and although she was almost fatally damaged, they somehow managed to bring her home.

2984

RAILROAD BARS RED CLOTHING

"Because of the possibility of being mistaken for signals, wearing of red clothing about the right of way is forbidden," reads a safety booklet recently published by a western railroad. The decree officially bars the red flannel shirt and necessitates hiding the red bandanna handkerchief.

Examiner 5/31/29

DRIFTWOOD HOUSE BUILT BY SEA CAPTAIN

Depending on the sea to bring his building materials to him, a retired sea captain has constructed a home entirely of driftwood on the Olympic peninsula, Washington. The cabin differs from the usual design as the walls are made of crosscuts of cedar logs and stones chinked with concrete, while some of the windows, resembling portholes of a ship, are formed by huge sections of logs from which the cores have been removed.

at the mouth of the Elwhah River



The Sea Furnished the Lumber for This House, Constructed Entirely of Driftwood; Above, a Close-Up of a Window, Made by Removing the Core from a Cedar Log

BIRDS THAT FLY THE AIRWAYS GIVE THRILLS TO PILOTS

Pilots flying the transcontinental air routes in Europe and America have been asked to aid in studying bird life at high altitudes as a result of recent encounters of the birdmen with the feathered flocks. At least one fatality was due indirectly to such a meeting, when two eagles attacked a plane over the Pyrenees, tore and clawed at wings and rudder and tried to dislodge the pilot with their wings. After half an hour, the pilot, in a badly damaged plane, was forced to descend in a wild part of the mountains and was fatally injured while his passenger was hurt. An-

other pilot, in a similar encounter over the Alps, was able to repulse an eagle with revolver shots. Birds are rarely sighted above 3,000 feet, although large ones have been seen as high as 12,000 feet. Scientists hope the airmen will be able to aid them in giving the height and speed attained by birds and in furnishing information of the flights of birds in migration. Many birds of smaller type show no fear of airplanes and swifts often gambol and wheel gracefully about the planes, being able to outfly them. Airmen have lost races with teal and mallards, only to see these birds overtaken by the swifter falcon. Recently an aviator witnessed a battle between a seagull and a hawk, in which the

Cont. p. 379. Williams, 33 Berkeley St. New York City. Colman, 29 Beane St. New York City.

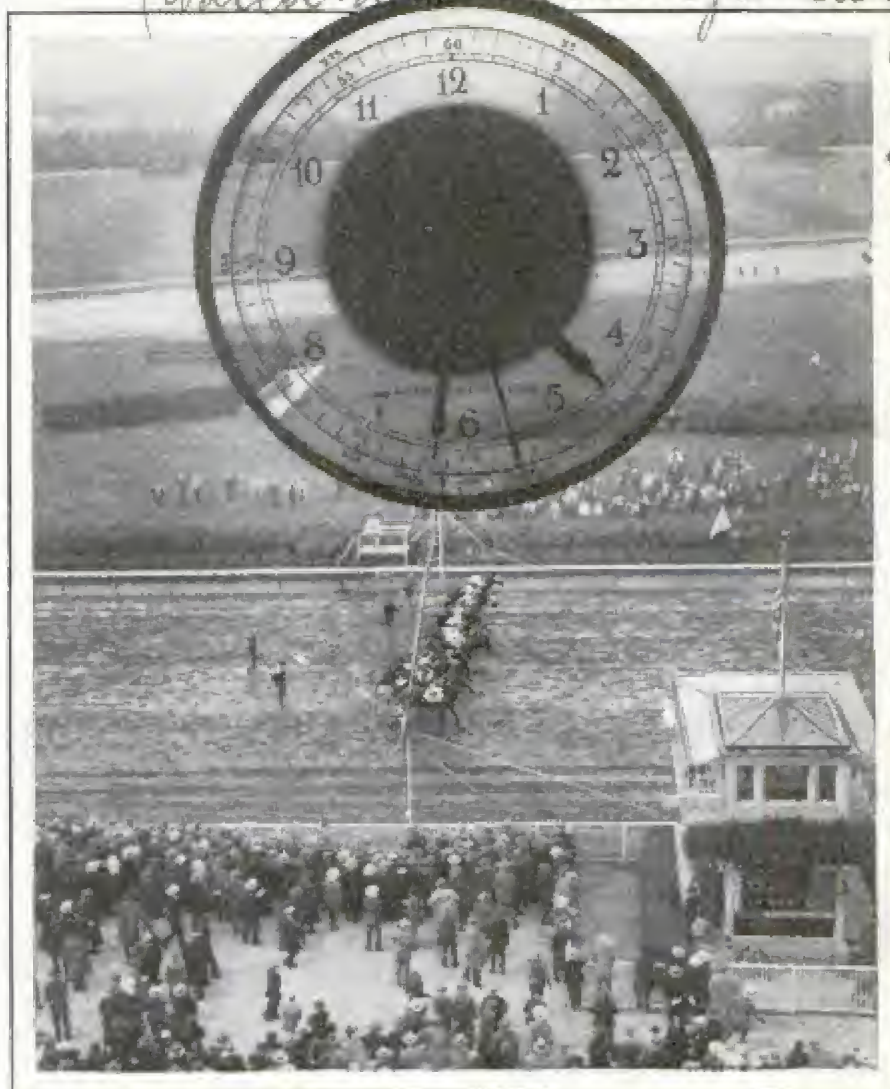
hawk emerged successfully, flying with its prey to the mast of an incoming ocean liner. It is believed that a bird's power of hearing waves above the human range of audibility may direct it in migrations. Many birds have eyesight 100 times keener than that of human beings, and aviators are expected to help also in studying the sight of the birds. The kestrel, for instance—a species of hawk—can detect small insects on the ground hundreds of feet below.

"STOLEN" FLASHES ON CAR IF THIEF TAKES IT

Stolen automobiles are able to tell the world that they are in the possession of thieves, if equipped with an accessory devised by an Australian. The automobile burglar alarm consists of an electric sign on the radiator which blazes out the word "Stolen," when a thief attempts to switch on the ignition, the sign remaining illuminated as long of the car is operated. It is controlled by a secret box attached to the ignition system, which must be unlocked before the ignition is switched on to prevent the sign from lighting.



Thieves Taking This Car Light the "Stolen" Sign When They Switch on the Ignition



Beginning of a Race with Exact Starting Time Recorded on the Picture by a Watch with Transparent Dial in the Camera

CAMERA AND CLOCK COMBINED TO TIME SPORTING EVENTS

Exact elapsed time of a race or other sporting event may be recorded on a picture showing the finish of the event by means of a transparent watch set in a camera. The watch is set next to the plate, and a lever is moved to set the watch in motion when the race starts. When the shutter is clicked to take the picture of the finish, the hands on the dial stop, and the watch image is reproduced on the negative, giving both the picture of the end of the event and the exact time.

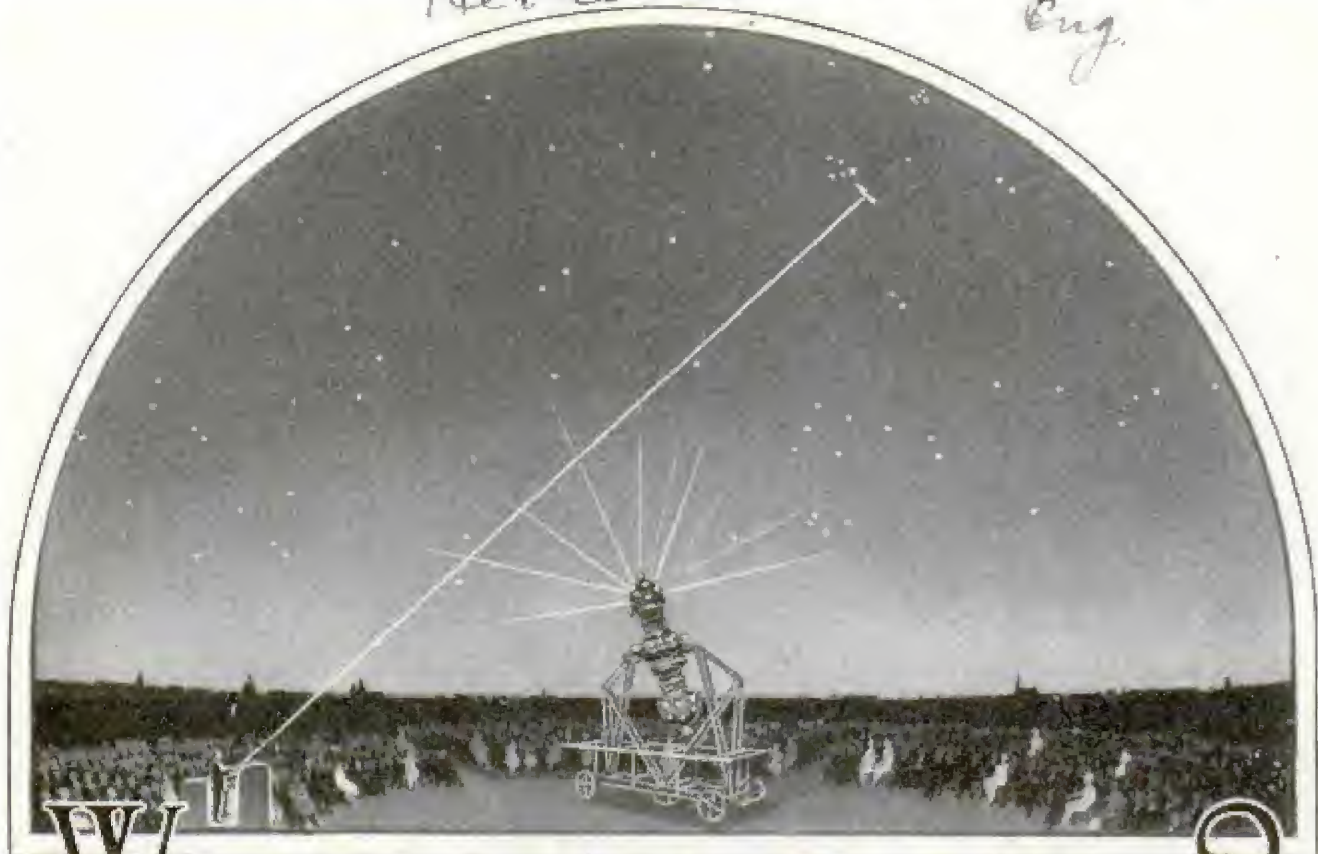
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Ans. Mr. Jackson
Sydney Australia
Letter rec'd

2892

Mr. E. W. Clavering
8, Shakespeare Road
Horne Hill London S.E. 24
Eng.



Where is the Pole Star Going?

IN THE YEAR 2102, an event is due to take place in the northern sky that no one since the dawn of recorded history has ever seen—the arrival of Polaris—the pole star—at the north pole.

When that happens, the star and the celestial north pole will be less than one-half of one degree apart, twenty-eight minutes of arc to be exact. But when they meet, the pole star will pass on without a pause, and in a few more centuries will be so far away that there will be no north star.

The star, which mariners first named Polaris, has been used as a guide to the true north for so long that men have forgotten the time when there was no pole star, but there have been many such times, and there will be again, for it is only once in 26,000 years that the north pole of the celestial sphere and this particular star come so close they virtually meet. The ancient Greek sailors did not recognize any pole star, for the latter was then ten or twelve degrees from the pole, which was nearer the constellation of the Great Bear, and it was the latter, which they

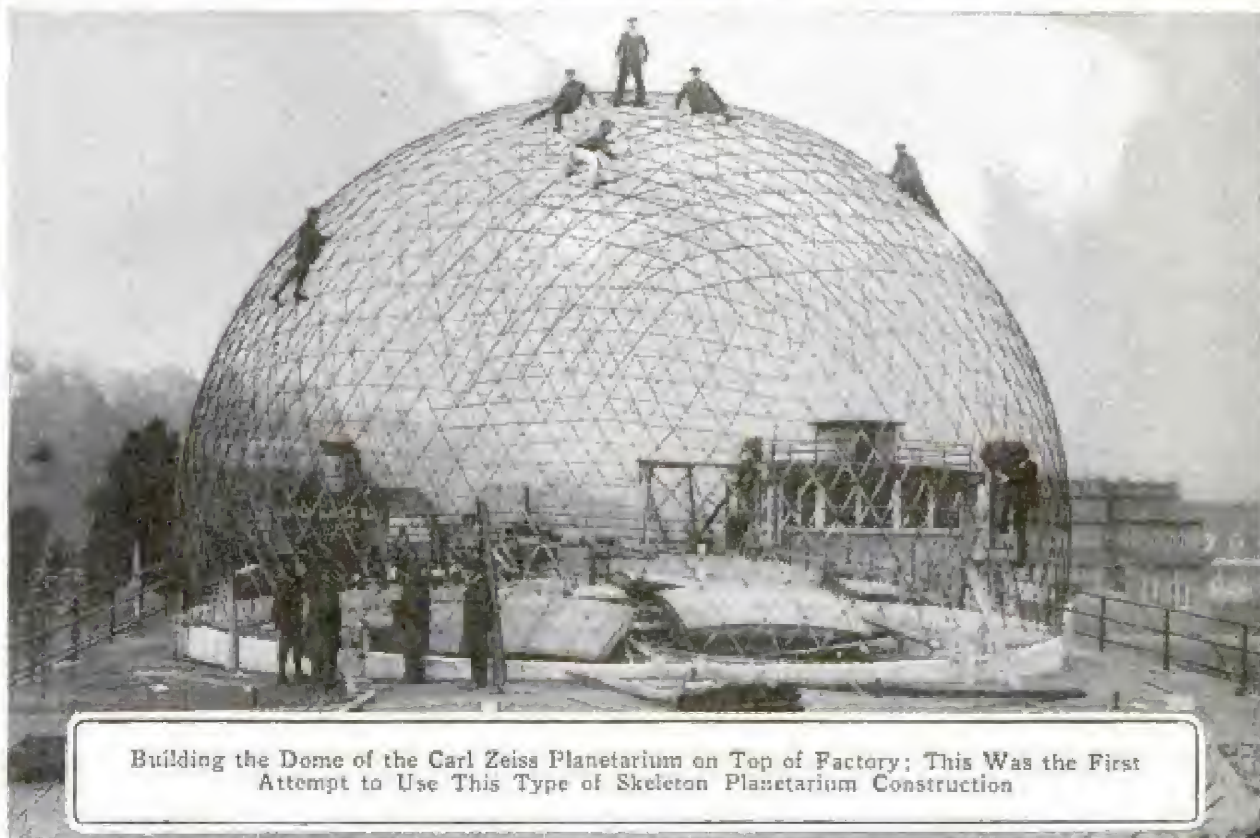
called Cynosure, they steered by. The Great Bear in those days was the cynosure for all eyes at sea, and the Greek word still survives in that sense.

Why the pole star apparently wanders around the heavens is one of the simplest of stellar problems, for it isn't the star, but the earth that is to blame. Instead of revolving constantly in the same plane, its axis slowly changes its direction from year to year as the earth moves about the sun. If this axis was continued as a mighty pointer sticking out into space from the north pole, the tip of the pointer would describe a gigantic circle in the sky, taking just under 26,000 years to make one trip around its orbit. In its course, the tip of the pointer would point once at the pole star, as it is going to do in 2102, and then pass on, to approach in turn, at intervals sometimes of several thousand years, other stars and constellations.

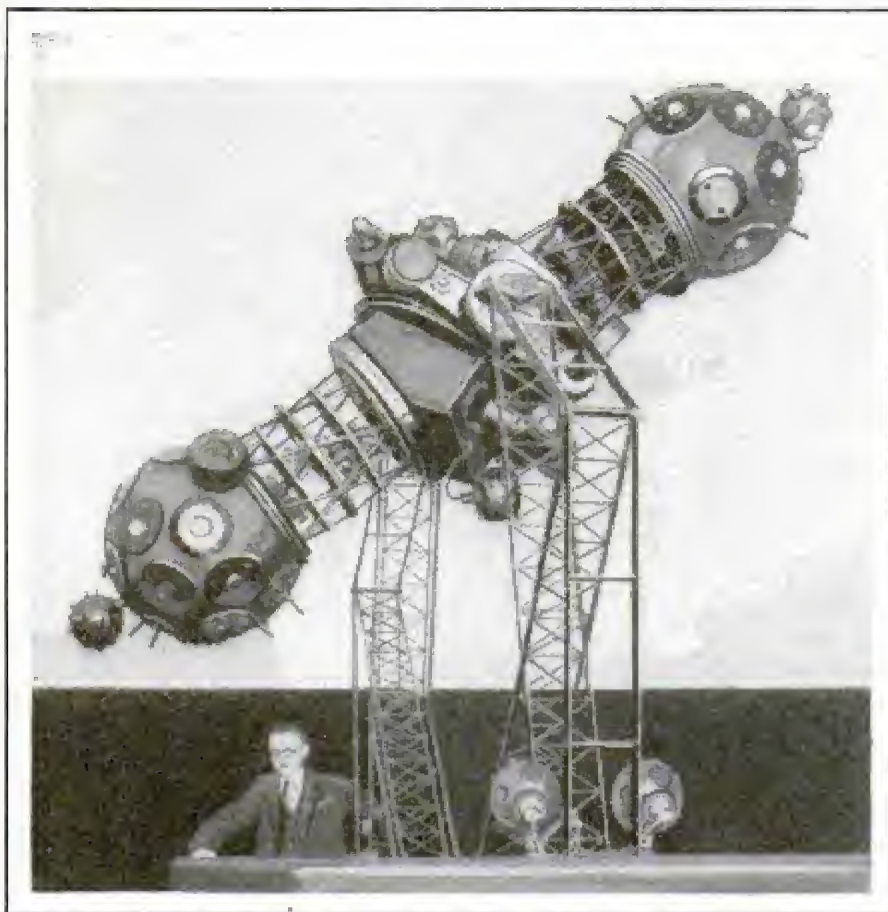
It is a curious coincidence that sailors undertook their first long voyages across the seas at a time when Polaris was near enough to the true north to serve as a fairly efficient guide and supplement to



Drawing on Opposite Page Shows Interior of German Planetarium with the Pointer of Light Lecturer Uses; Above, Planetarium to Be Constructed in Chicago, and, Below, the One at Dusseldorf, Germany



Building the Dome of the Carl Zeiss Planetarium on Top of Factory; This Was the First Attempt to Use This Type of Skeleton Planetarium Construction



Close View of the Projector Which Casts Beams of Light to Represent Stars and Is Adjustable to Many Positions

their crude methods of navigation. Some idea of the speed of modern development, as compared with the slow processes of time in the heavens, is gained from the fact that in the period it has taken the star to shift those few degrees nearer the pole, the entire science of navigation has been developed, and reached the point where Polaris no longer plays any part in sailing, save for an occasional use in reckoning the latitude, a use that can be served as well by any number of well-known stars scattered throughout the heavens.

Because of the inclination of the earth's axis, some stars never set for most of us, some rise and set, and others are never seen, if the observer remains in his own latitude. The stars that never set are those between the pole and a circle whose edge would just touch the observer's horizon. The stars in that zone of the sky are therefore never seen by people living in the same latitude in the other hemisphere. The astronomer calls these stars, because they are always visible, the stars of "perpetual apparition." The group at the other extreme of the celestial sphere, which never rise, are termed stars of "per-

petual occultation." In between the two circles are the stars that rise and set. Those to the north, if the observer is in the middle northern latitudes, travel most of their course above the horizon, and those near the southern horizon barely rise above it.

The working of this system can best be imagined by picturing the observer seated in the center of a circular platform suspended horizontally in the center of a huge hollow globe, representing the celestial sphere, the globe built to turn on pivots placed on the line of the earth's axis. The platform represents the horizon, and the observer can see nothing that happens below it. Paint the con-

stellations on the inside of the sphere, start it turning, and the whole machinery of the universe is visible at a glance.

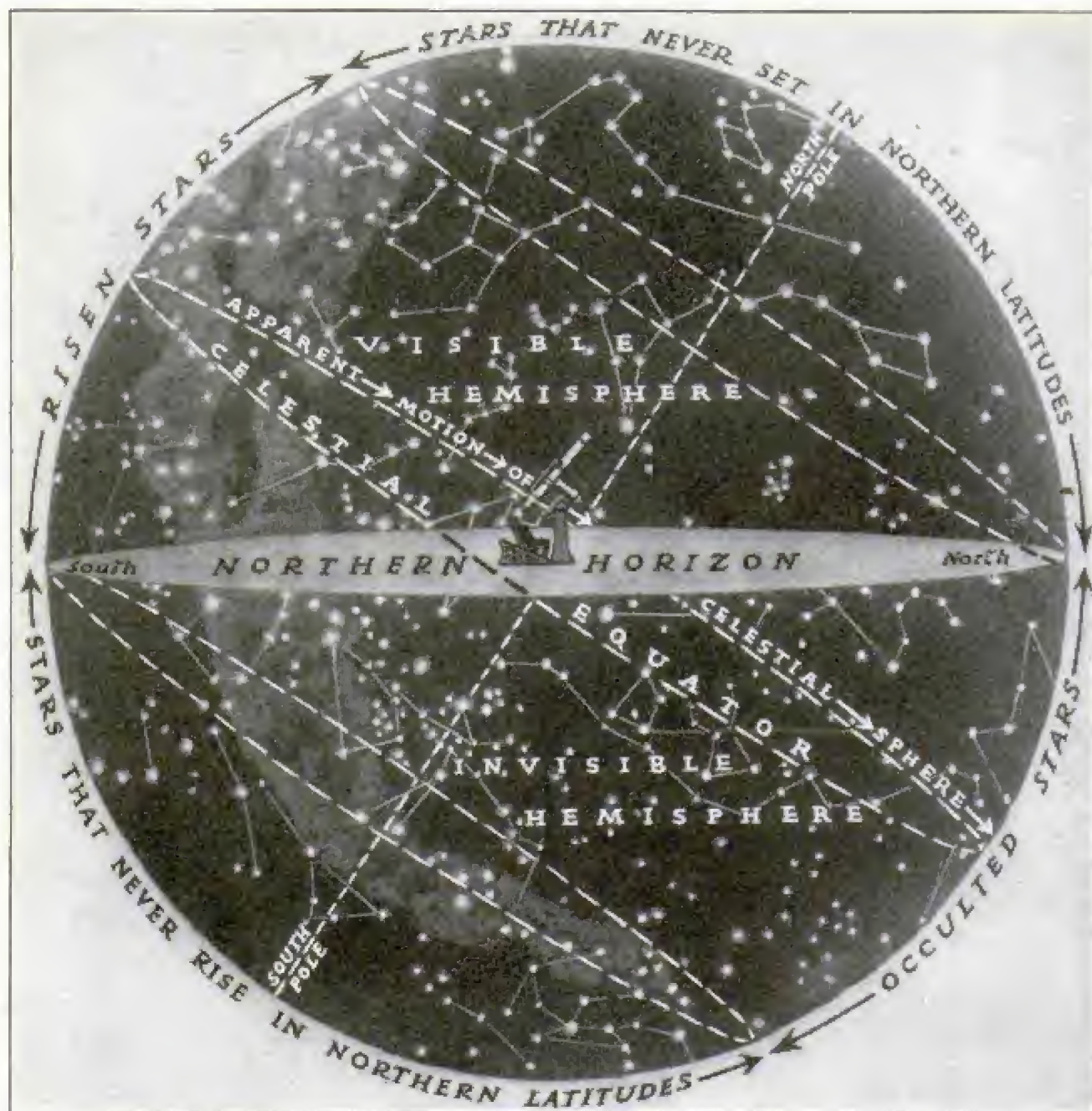
That, as the artist has pictured it in one of the illustrations, is the essence of any demonstration of the solar system. The planetarium evolved in Germany has improved on it by reducing the globe to one hemisphere, in the form of a dome, which is fixed in place, while the stars are replaced by lights projected onto the ceiling, and the mechanism of the projector provides the movement, doing away with the necessity of revolving the globe.

The planetarium has another advantage, for, while the pivots of a huge globe would necessarily be fixed, and the heavens could only be shown, therefore, as they appeared or will appear at one fixed date, the planetarium projector can be geared to shift at will to simulate the wobbling of the earth's axis, and the projected lights made to represent the sky as it appeared at any date in the past, or as it will appear at any date in the future. One of the interesting things about the planetaria established in Germany is their ability to show the sky as Charlemagne or Julius



Copyright, S. W. Clatworthy

Drawing to Illustrate the Effect of the Bulge of the Earth at Equator in Relation to the Sun and Moon; It Causes the Polar Axis to Waver



Copyright, S. W. Clatworthy

Looking through a Telescope at a Latitude Approximately That of Chicago, to Show the Relation of the Visible and Invisible Hemispheres and Their Stars

Cesar saw it, or as it appeared to Noah while he navigated the ark.

The Chicago planetarium, surmounted by an eighty-five-foot copper dome, on the inside of which the stars are to be pictured, is being built on an island in Lake Michigan. When it is completed, the projection machine will be able to show the heavens as they appear from any point on the globe. A touch of a button will transfer the onlooker to the north pole as easily as the radio takes him to distant climes, and another touch will transport him to the south pole, with the Southern Cross shining directly overhead. The Zeiss pro-

jector is so built that it can be speeded up until the planets and their satellites dart through the sky at such a rate an entire year's movement can be shown in seven seconds. Or the operator can stop the movement of all but the sun and moon, and show their paths for a year or more through the maze of distant constellations.

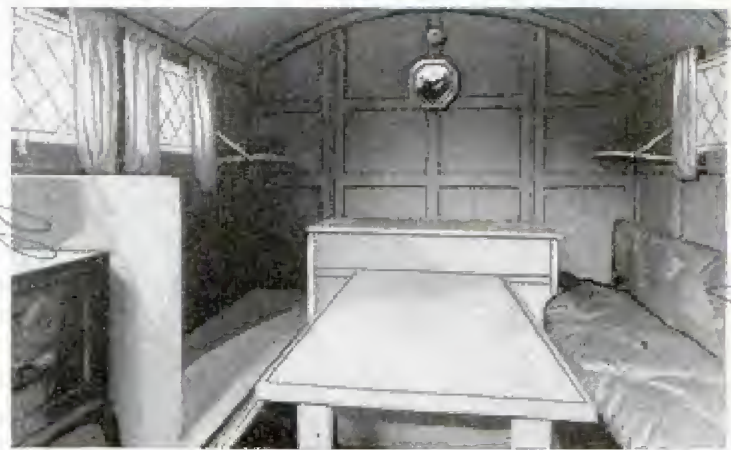
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Engen. Cuttard May 20/29
25 Broadway, New York

**GASOLINE-TANK LOCK
THWARTS THIEVES**

Replacing the ordinary cap on an auto gasoline tank, a recently developed locking cap offers additional protection against theft of the car. A sleeve takes the place of the old cap on the tank, and is fastened immovably. Over this sleeve the locking cap is screwed. By screwing the cap down tight, and locking it, the tank is made air-tight, and no gasoline will flow to the vacuum tank. By unscrewing the cap a couple of turns and relocking, air is admitted to the tank and the normal flow to the vacuum tank is resumed. For cars equipped with a pressure gasoline feed the process is reversed. In this case, when the cap is not tight, no pressure can be built up in the tank, and the car cannot be started. When the cap is tight, the car is ready to operate.

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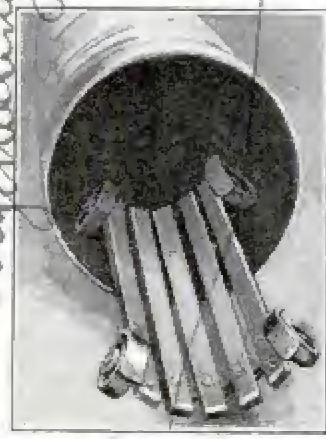


At Top, Campers' Collapsible Home on Trailer; Center, View of Interior, and, Below, Packed for Traveling

**"BUGGY" GIVES PAINTERS
ACCESS TO PIPES**

Through the use of rubber-tired "buggies" on which a man can lie and propel himself in a pipe, a San Francisco water company has solved the difficult problem of completing the inside protecting paint coat at the joints of steel water pipes from sixteen to thirty-six inches in diameter. In larger pipes, crawling is possible, but in the smaller sizes, the buggy has been used to allow men to enter pipe lines as far as 1,000 feet. The appliance consists of two

axles, about four feet apart, and a light body of boards, the axles being bent to follow the curve of the pipe. Lying on the buggy, the painter propels himself with his feet and carries painting equipment in his hands.



**CAMPERS' COLLAPSIBLE HOME
IS MOUNTED ON TRAILER**

Campers who dislike tents now may take along a collapsible home mounted on an auto trailer. On the road, the van folds into one-third its normal size for towing, but when parked and opened, it becomes a roomy compartment with bunks, a lounge, baggage room, five cupboards, a clothes chest, stove, and cooking and dining equipment for three persons. It is fitted with a door and rear and side windows.

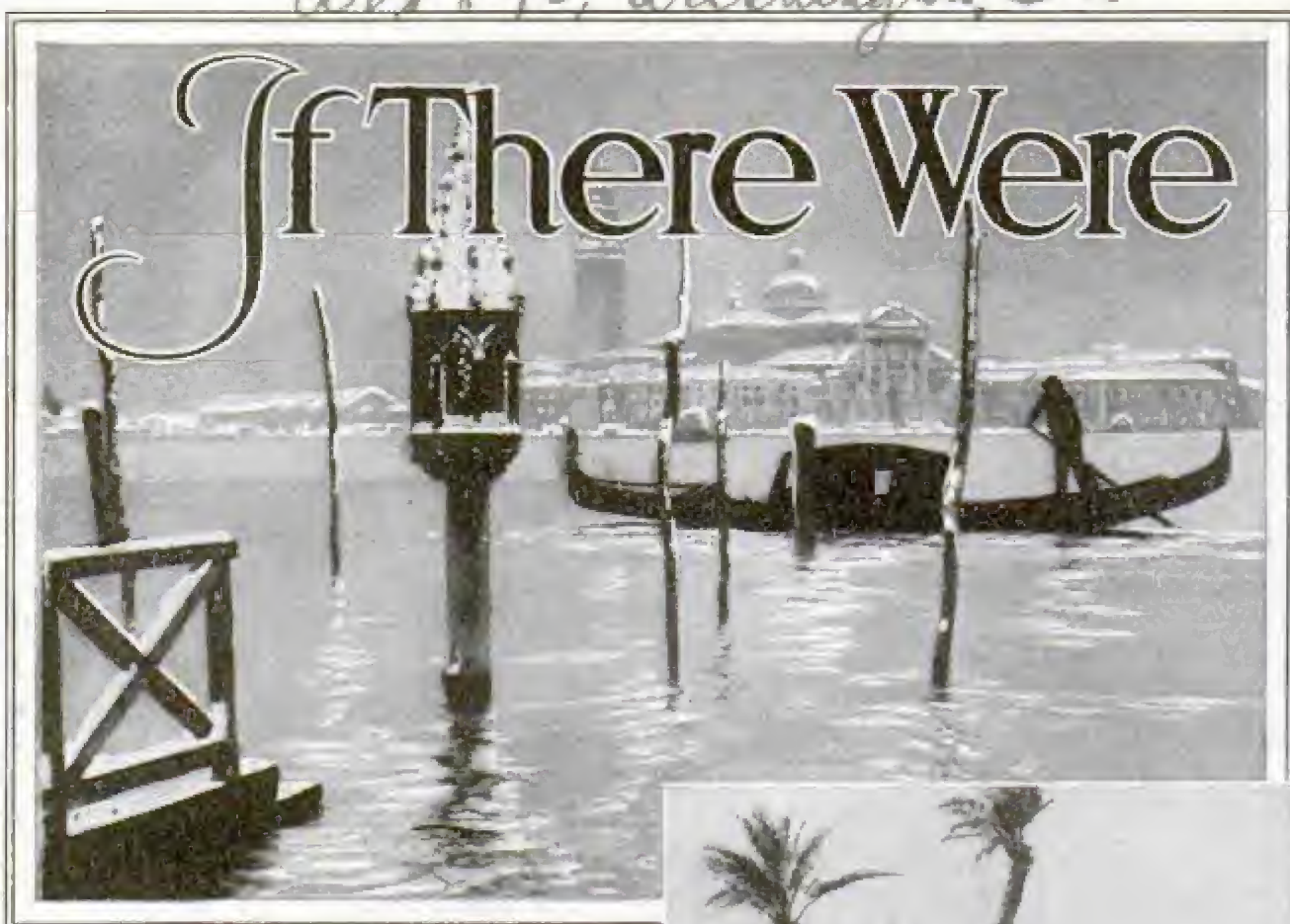
■ The first iron works in America was near Richmond, Va.

Collapsible Home, 1111 1/2 St. of Engineers, London, W.I. England
S.A. Sanford

Engineering News-Record 6/10/29

Clad of business 9/10/30

Spring Valley Water Co.



What a February Snowstorm Did to Venice This Year, and, Below, an Oasis Village in the Sahara

ONCE more science is busy with the Gulf Stream. The latest chapter in the long history of research relating to this most famous of ocean currents is now being written at the Straits of Florida. On board the three car ferries of the Florida East Coast railway, which make daily round trips between Key West and Havana, careful observers are making frequent measurements of the water temperature with tested thermometers. One of these ships, the "Henry M. Flagler," carries an elaborate instrument, which continuously and automatically registers the temperature of the water at the vessel's intake pipe, many feet below the surface of the ocean.

Meanwhile experts are digesting the results of these observations, figuring the speed of the current from the plotted drift of the ferries, and from the combined records of water temperature and water movement are trying to learn just how much heat from the tropics is delivered each day by way of the narrow passage between Florida and Cuba to the North Atlantic ocean, where it becomes one of



the chief factors in controlling the weather of adjacent lands.

Will this undertaking help to give us more accurate weather forecasts and enable an increase in the range of time for which such forecasts can be made? Certainly many meteorologists cherish such a hope, however cautiously they may express their views on the subject.

No Gulf Stream

The idea of getting a line on coming weather by making observations at the fountainhead of the Gulf Stream is an old one. It dates back to the winter of 1845-46, which was very abnormal in England and elsewhere in western Europe. The weather was exceptionally mild and was accompanied by much rain and high southwesterly gales. An English scientist, Colonel Sabine, attributed this abnormality to an unusual extension of warm water from the Gulf Stream toward European shores. He suggested that such conditions might result from an unusually rapid flow of water through the Straits of Florida some months earlier, and that, if regular observations were made at the straits and reported to England, the occurrence of unusually warm or cold seasons might be forecast with fair certainty.

Since Sabine's time, a great deal has been learned about weather and likewise about the Gulf Stream, but the relations of this ocean current and others to weather are still somewhat obscure, despite a vast amount of controversy that has raged over this subject. Some relations between the Gulf Stream and the atmosphere are beyond question. Its movement is due chiefly to the trade winds, which, blowing from easterly quadrants, produce a great westward drift of water across the Atlantic in the equatorial region. This is called the Equatorial current. As its progress is blocked by the



According to Scientists, Rocky Mountain Conditions Such as This Would Prevail in Sunny France If the Gulf Stream Were Cut Off

American continent, part of the water turns southward along the coast of South America, part (called the Antilles current) flows north to the eastward of Cuba and the Bahamas, but, mainly on account of the shape of the coast, the greater part passes through the Yucatan channel into the Gulf of Mexico.

Here the Gulf Stream proper is born. On account of the narrowness of the exit through the Straits of Florida, the water is banked up until it is a foot or more above the level of the Atlantic, and it is this "head" of water that gives the stream its swift flow northward along the coast of the United States. In the Gulf, also,

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the already warm water becomes even more strongly heated and grows very salty through excessive evaporation.

From the Straits of Florida the Gulf Stream emerges into the North Atlantic as the mighty swift-flowing indigo-blue "river in the ocean." As it leaves the Gulf, it is only about fifty miles wide and 2,100 feet deep. Even so, says Admiral Pillsbury, the water flowing through the strait each hour amounts on an average to 90,000,000,000 tons, and if this hourly supply were evaporated, it would yield more salt than a hundred times all the seagoing vessels afloat throughout the world could carry. The heat conveyed by the water from the torrid to the temperate zone is supposed to be more than would be produced by the burning of 2,000,000 tons of coal a minute.

Passing northward, the Gulf Stream is joined by the Antilles current, from which it receives an additional large supply of heat. Off the coast of Newfoundland, at a location that varies with the season and also to a considerable extent from year to year, it encounters the cold Labrador current, flowing down from the Arctic. The contrast in temperature between the two currents is so sharp that on one occasion a vessel of the International Ice Pa-

trol, passing from one to the other, measured a temperature of thirty-four degrees at the bow and fifty-six degrees at the stern at the same moment. Here, in spring and early summer, icebergs menace shipping, and at all seasons the mingling of the warm and cold air masses overlying the two currents produces the fogs for which this region is notorious.

East of the Grand Banks, the Gulf Stream water is driven by the prevailing westerly winds eastward toward the shores of Europe in a broad slow-moving shallow current known as the Gulf Stream drift. A branch of this drift curves south to join the Equatorial current, completing the circuit of waters around the great Sargasso Sea, while the rest sweeps on toward the British isles and northward in branches that bathe the coast of Norway, of Iceland and even of Spitzbergen, 700 miles north of the arctic circle. The water is still comparatively warm after its long journey across the Atlantic. The mean sea temperature off the Hebrides is more than forty-seven degrees higher than off the American coast in the same latitude and in the course of the Labrador current, while the influence of the warm water is sufficient to prevent ice from forming in the Norwegian fjords wherever



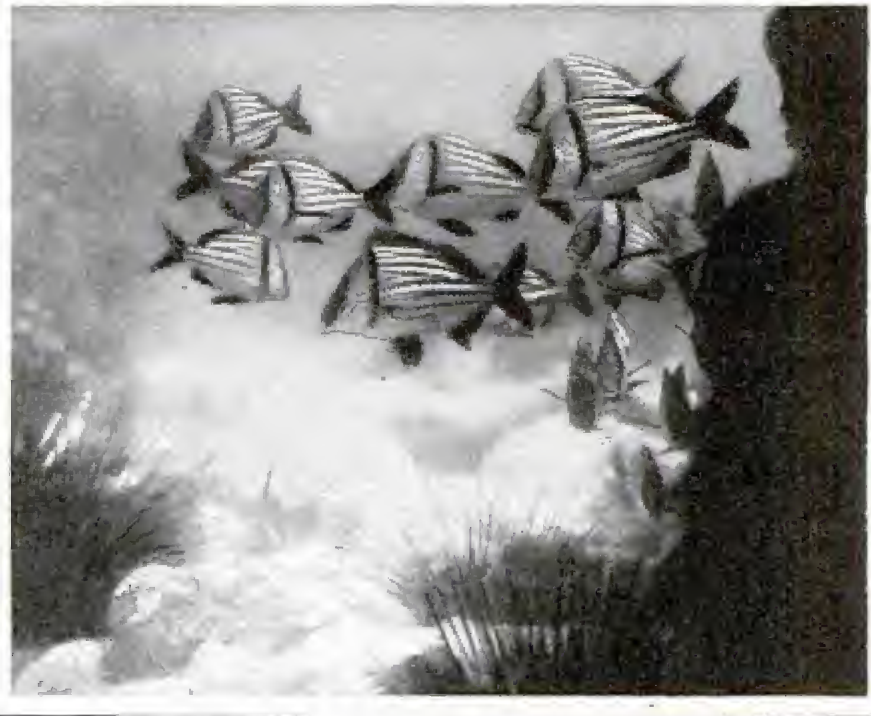
Where the Warm Gulf Stream and the Cold Labrador Current Meet, Fog Banks, like This One, Are Common; Long Dreaded by Mariners, They Are Now Feared by Aviators Venturing over the Ocean



they are freely open to it.

The gigantic volume of warm water that the Gulf Stream pours into the North Atlantic necessarily warms the air above it. What are the effects on weather and climate?

A marine current can affect weather on shore only through the agency of the winds. Both Europe and the United States lie in a region where there is a general drift of the atmosphere from west to east. Thus the influence of the Atlantic is more felt in western Europe than in the eastern United States; the former having milder winters and cooler summers than the latter. One of the principal regulators of weather in the North Atlantic region is a permanent low, lying usually to the south of Iceland and known as the "Iceland low." It is produced by the contrast in temperature between the warm ocean water and the cold ice caps of Greenland and Iceland. As the latter do not melt away in summer,



Courtesy The Carnegie Institution

Benjamin Franklin's Chart of the Gulf Stream, Published in 1770, and School of Pork Fish at Loggerhead Key, Florida

this low lasts throughout the year, but it varies greatly in location, size and intensity—partly, at least, on account of changes in the temperature of the Gulf Stream water—and these variations have marked effects on European weather. The circulation of air around the Iceland low causes Europe to have a great prevalence of winds from the southwest—hence from a relatively warm part of the Atlantic.

The question is sometimes asked: What would happen if some radical change should occur in the course of the Gulf Stream, so that it no longer supplied its warm waters to the northern part of the Atlantic? While it is hardly possible to foresee all the consequences of such an event, some of them can be stated with more or less confidence. The cooling of the ocean water would weaken the circulation of the winds over it, and in the eastern United States, where the bulk of the rainfall is now due to winds from the Atlantic, the climate would become much drier.

The effects on the climate of Europe would be far more striking. The Iceland low would cease to exist. There would be a prevalence of northwesterly winds, which, blowing from a cold ocean and from the ice fields of the Arctic, would cause intensely cold winters in European countries. Warm weather might prevail in summer but, on account of the high latitude, it would be of comparatively brief duration. There would be a rapid growth of the glaciers, and, in short, a gradual return of the Ice Age. Eventually—perhaps in a few years or decades—the majority of storms would pass so far south that the now arid regions of northern Africa would receive copious rains. The Sahara desert would “blossom as the rose,” and the Egyptian peasants would no

longer need to irrigate their fields with the water of the Nile. Thus the same change that would ruin Europe would bring prosperity to the southern shores of the Mediterranean.

The permanent dislocation of the Gulf Stream, though not likely to be witnessed in our time, is not absolutely impossible. When the building of the Panama canal was first talked of, fears were often expressed that, by opening a passage to the Equatorial current, it might cause that current to flow into the Pacific and thus cut off the supply of the Gulf Stream. Of course, these fears were groundless, because any ordinary canal, even if built without locks, would be far too small to have such an effect. On the other hand, a broad sea-level channel cut through Central America—say at the Gulf of Honduras, which lies closer to the present course of the Equatorial current than does the Isthmus of Panama—would certainly deplete the Gulf Stream, and, if it were big enough, would obliterate it altogether. There is, to be sure, no likelihood that engineers will ever construct such a channel—but nature may. A tremendous earthquake, in that notoriously seismic region, might cause a subsidence of the land and open just such a passage.

The damming of the Straits of Florida would probably have pronounced effects



Where a Railroad Worried Weather Prophets; Some Predicted That This Viaduct over the Florida Keys Would Dam the Gulf Stream Sufficiently to Affect the Climate of Europe

on the climate of Europe, despite the fact that much warm water would still be borne northward by the Antilles current. Prof. Alphonse Berget, of the Oceanographic Institute in Paris, has lately suggested that this may happen some day—not through the work of mankind but through that of reef-building coral "insects."

"Should the Gulf Stream be thus diverted from its course," he writes, "the British isles, France and Portugal would have rigorous winters, with temperatures

down to thirty or forty below zero. Sleighs would be seen on the streets. People could indulge in winter sports, agreeable, no doubt, to some, but the change would be painful to most of us, habituated as we are to a mild climate."

Europe had a taste of such conditions last winter. There was nothing wrong with the Gulf Stream, but an immense area of high atmospheric pressure spread, for some unknown reason, over the northern part of the continent, and for several weeks the influence of the mild ocean was cut off. In many districts, the weather was the coldest ever known. Snow fell on the shores of the Mediterranean, and fifteen-foot snowdrifts were reported from Constantinople. Such was Europe, deprived temporarily of the genial warmth of Gulf Stream waters.

The important relations of the Gulf Stream waters to fisheries are recognized in the many investigations that have been carried on by the international council for the study of the sea on the European side of the Atlantic.

An example of this was experienced on our side in the year 1882, when a temporary shift of the stream, under the influence of heavy north winds, destroyed edible tilefish in enormous numbers. It was estimated that fully a billion of the fish were killed by exposure to cold water, and for some years the race was believed to be extinct.



It Does the Work of Several Persons in Keeping Books, Adding and Other Tasks; the "Business Brain" in Operation

MACHINE AS "BUSINESS BRAIN" DOES WORK OF CLERKS

Cards, properly punched, are translated into budget reports, sales analyses, statements and other lists on a time and labor-saving machine recently introduced in Los Angeles. Only three persons are needed to operate it, and it is said to perform the tasks of a bookkeeper, an adding machine, cash register and calculator.

FLASHLIGHT FOR ANGLER TELLS WHEN FISH BITE

Fish that toy with bait before they strike send flashlight signals to anglers whose rods are equipped with a visible warning apparatus consisting of a small battery and an appliance which fits on the fishing rod in such manner that contact is made



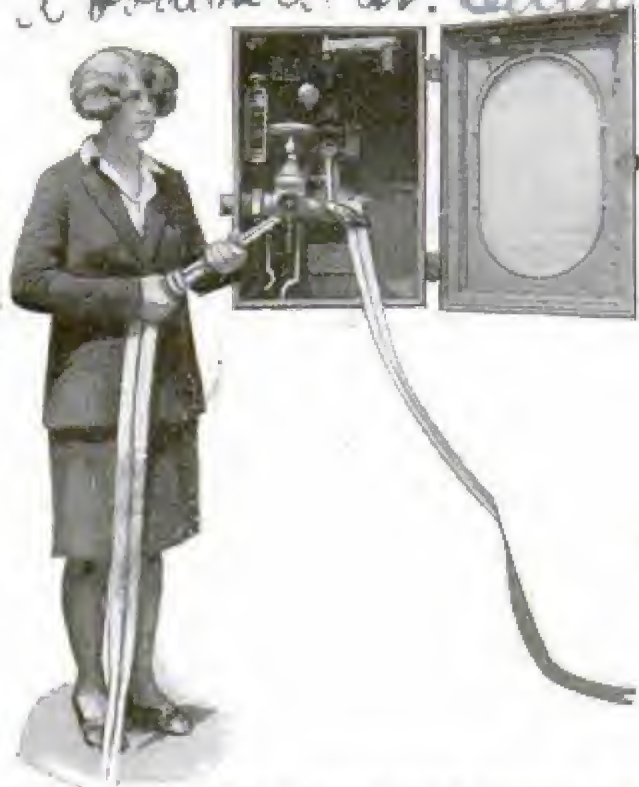
and a light flashes when the line is pulled even gently. The signal weighs but three ounces and may be used on rods or on tie-ups in ice fishing. When the fish is playing with the bait, the light flashes on and off, but when it strikes, a lever moves down to throw the light on constantly and at the same time automatically releases the line.

☞ Butterflies' wings are covered by scales.

*50 Broad St.
Newport*

*and
Power*

*My
Shirley Toy Mfg. Co.
Box 1009, Chemedady, N.Y.*



Wall Fire Hose Which Automatically Turns on the Water and Sends in an Alarm

WALL HOSE RINGS FIRE ALARM WHEN LIFTED FROM HOOK

Snatching a fire hose from an automatic wall cabinet will simultaneously open the hose valve, turn in a general fire alarm and register the location of the fire on an annunciator in the office of the building. For extremely large buildings there is also furnished a signal showing the approach to and location of the fire in the building, to avoid delay by the fire fighters in finding the point of the blaze. The appliance is operated when fifty feet of hose has been pulled from the cabinet which automatically releases the valve, this in turn starting the alarms and signals before the water has reached the nozzle of the hose. Ten seconds is the time estimated for the entire operation.

QUAKES LINKED TO MOON

The position of the moon has a definite relationship to some earthquakes, according to Maxwell W. Allen, of Sanger, Calif., who has studied more than 1,200 earthquakes occurring in California since 1812. When an earthquake happens on a fault line, or crack, running northwest, the moon is likely to be in the western sky, or else has not risen and is in just the

opposite direction. "It appears that these shocks show a tendency to take place with the moon between the meridian and the western horizon, or between the nadir and eastern horizon," he said. "Shocks on the less numerous east-west faults cluster in the opposite quadrants. Where a series of quakes are observed in the same place, four or five of the stronger shocks occur with the moon within thirty degrees of the same part of the sky as the main shock of the sequence."

AUTO TIRE CUTS REPAIRED 3005 WITHOUT DEFLATING

Repairing surface cuts, blisters and sand pockets without removing the auto tire or letting out the air is made possible with an electric combination spot-and-tube vulcanizer. The appliance is used to repair surface cuts before they get deep enough to allow water to soak into the cords. The cut is cleaned and filled with raw gum, after which the portable heater is clamped to wheel and tire and left for twenty-five minutes. An automatic temperature control regulates the heater while the repair is curing. It also may be used as a plate



This Vulcanizer Repairs a Surface Cut without Removing or Deflating the Tire

and clamp for ordinary tube vulcanizing. In this capacity it heats in eight minutes.

C.A. Shaler Co.

held in Berkeley, Calif. June 20th

at Seismological. Santa Barbara

June 20th 429-0 6/15/29



It Looks like a Motorboat on Barrels, but This New Instrument of War Makes Eighty Miles an Hour, in Contrast to the Lumbering Tanks of the World War

ARMORED TANK MAKES SPEED OF EIGHTY MILES AN HOUR

Traveling over rough ground at sixty-five miles an hour, and going eighty miles over a smooth roadway, a high-speed tank, successor to the lumbering machines of the World War, recently was tried out at Governor's Island. Machine guns and anti-aircraft guns form part of the equipment of the speedy instrument of war.

RHEUMATISM AS RAIN PROPHECY APPROVED BY SCIENCE

Scientific confirmation of the popular notion that persons suffering from rheumatism are good weather prophets has resulted from recent experiments for one year on 367 patients suffering from arthritis. For more than ninety per cent of the time, doctors found, there was a relation between the presence of storms and the increase of pain. For seventy-two per cent of the time the patients appeared to suffer more pain as barometric pressure fell and experienced relief with a rise, while for twenty-one per cent of the time the curve of pain went up when the barometric curve went down, and vice versa. Observations on humidity, temperature and atmospheric electricity were inconclusive, but it is believed possible

that these agents working together had some effect on the patients. Just how the change acts to increase the pain is not known, although a theory was expressed that the blood supply to the joints may be affected.

SHELL-LIKE FARM IMPLEMENT BREAKS UP HARDPAN

Breaking up hardpan formed by continually plowing ground with the same plows is being accomplished in California with an implement resembling an explosive shell. The tool, oblong and round with a point at one end, is known as a mole and is placed at the bottom of a furrow and pulled through the ground. It also is used for the purpose of providing



drains in land of such nature as to hold water.

Our Bureau of Information will answer all questions regarding articles appearing in this magazine.

Alameda, Calif.

Captn. C. W. Purcell is at the head of the 3256 Hardpan are at the head of the

Report to American

Chicago Daily News 6/24/29

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Boston Sunday Post, Boston
Mass

Unsung Heroes of



Sir Ernest Shackleton, Noted British Antarctic Explorer, Having a Wrestling Match with a Husky

By JOHN T. BRADY

COMM. Richard E. Byrd's desperate attempt to crown his glorious flying achievements by planting the Stars and Stripes at the south pole, as he did at the north pole, brings to a dramatic climax America's inspiring record of polar exploration.

But while you read, with patriotic pride, the thrilling accounts of the progress of the undertaking and praises for the courage of the commander and his men, give a thought occasionally to the dog heroes of the expedition, numbering close to one hundred. Think of these gallant canine explorers down there on the ice barrier, bucking into blizzards which lash and beat them like a million whips, struggling on though their feet be painfully lacerated by sharp ice and their bodies half paralyzed by the bitter cold, always leading the

way into the vast unknown emptiness and setting an inspiring example of determination and perseverance for their masters, with never a thought of pausing to rest until the exhaustion of human endurance demands it.

It is of these unsung heroes of the Byrd expedition and other efforts at polar exploration, these red-blooded utility dogs of the north who cannot speak for themselves and who know no religion except faithful service to man, their god, even though it mean death, that I sing, hoping to awaken the human sympathy and admiration which they so richly deserve. From the beginning of polar exploration, sledge dogs have played an important part, for almost every polar explorer relied upon them to guide and safeguard his footsteps over treacherous ice and ultimately drag him to his objective in the face of any difficulties.

Without their help, Peary, indomitable as he was, could never have reached within several hundred miles of the north pole, nor could he have returned alive. In acknowledging his debt of gratitude to them he says:

"It is an absolute certainty that the north pole would still be undiscovered but for the Eskimo dog to furnish traction power for our sledges, thus enabling us to carry supplies where nothing else could carry them."

That was written, of course, before the idea of flying to the top of the earth was dreamed of. But even today, when the airplane has reached a high degree of efficiency, Commander Byrd realized that without the help of sled dogs he could not hope to get within a safe flying distance of the south pole.

"They are the only possible insurance we can have for safety," Commander Byrd declared solemnly in telling why he considered them essential to the success of his expedition. "First we will need them

Polar Dashes



Composite Photograph Showing a Team of Byrd's Dogs, with Walden at the Gee Pole of the Forward Freight Sledge, as They Look in Action against the Antarctic Ice Barrier

in the work of hauling supplies. Then they will be used in searching for airplane landing fields and in setting up subbases. Thus, should my plane be forced down by one of the blizzards which start so quickly in the Antarctic, or by mechanical trouble, I will have some chance of landing near one of the emergency bases and surviving the storm. Also, with dogs and a couple of men at each subbase to help clear a runway, it may be possible to take off again after such a mishap, unless the plane is too badly wrecked.

"Without such emergency bases, I would indeed be in a desperate situation in case of a serious accident to my plane near the pole, and there would be no hope of reaching my main camp on foot, for animals for food do not exist in the antarctic interior, as Scott and Amundsen have already proved.

"So, if worst comes to worst, and I cannot fly back to the main base, I will be able to make a safe return by dog team. Snowstorms or blizzards may stop an air-

plane, but they won't stop a good team."

That's one reason why Byrd is using the oldest as well as the most modern form of transportation, but there is another based upon a tragedy which demonstrated the vital value of sled dogs to the antarctic explorer.

Once a great British explorer, Scott, made the fatal mistake of thinking that heavily furred ponies would be better than husky dogs to take him to the south pole. And he did reach it, but only to make a disappointing discovery. Amundsen, who had started later for the same goal by dog team, had reached it a month before him, and the Norwegian explorer's dogs brought him safely back, too, while Scott perished when his ponies failed him on the return trip.

"The whole difference between Amundsen's dash to the south pole and Scott's heroic struggle and tragic finish may be expressed in four letters, D-O-G-S, and this is said, not in a spirit of criticism but of sorrowful fact," commented Peary.

Remembering this most tragic episode of antarctic exploration, Commander Byrd wisely chose husky sled dogs as his "safety insurance." As long as they have a leg under them, as long as there is a limp left in their gaunt and weary bodies, they will forge on, game to the last breath. This was touchingly illustrated by the story of old "Spy," told me by one of the members of the Byrd expedition who spent some time in Antarctica, last winter, but returned to the United States on the ship that came back for necessary additional food, equipment, and more dogs to replace thirty-seven which had already given their lives to the cause, victims of contaminated water.

Though a rather old dog, "Spy" threw his bulk into the harness with all his strength, and his willingness, grit, and pulling power won the admiration of every man in the camp. But eventually he broke down under the strain, and one morning Commander Byrd found him more dead than alive from cold and exhaustion. He picked up the benumbed form of the animal and took it into his own quarters. After a few days of careful nursing, the dog began to gain strength, and as soon

as he was able to walk, he whined to be let out. Then he did something which wrung the hearts of the most unsentimental of Commander Byrd's followers.

While he was outdoors, the team in which he used to run drove up to the commander's headquarters. Old "Spy" greeted his former teammates with a joyous howl, and though one of his paws was still so sore that he could not touch it to the ground, he hobbled on three legs to his customary place in the team. And when the driver, after receiving orders about the load, made no move to harness him, it was pitiful, and wonderful too, to see "Spy" limp painfully back to the man's side, whimpering and begging as plainly as could be to be hooked in his place. Commander Byrd called to him as the team started mushing, but old "Spy" broke into a shambling run, and moving his poor stiff legs by sheer will power, limped along in his old place, until he dropped in his tracks.

Everybody in camp realized that old "Spy's" working days were over, and a rousing cheer went up when the commander announced that there would be no more trail for the dog, and henceforth



Siberian Huskies, Not So Large as Some Other Types, but for Combined Speed and Endurance on a Long, Tough Trail, They Cannot Be Beaten

"Spy" would be the mascot of the expedition, taking the place of "Chinook," who strangely disappeared into the icy antarctic wilderness when he felt he was no longer useful to man.

No wonder the owners of such huskies care little about fine points of pedigree, or whether they have drooping or upstanding ears, beautiful lines, markings, etc. They say blood will tell, but when a man's greatest need is the assurance that his dogs can make the grade when hundreds of miles of ice and snow and freezing wind lie between him and civilization, he must, if he values his life, call upon the red-blooded husky rather than the blue-blooded pedigreed thoroughbred.

It is quite generally agreed, however, that to be worthy of the name, a husky must have a strain

of wolf blood, but the common belief that the Eskimo husky is almost identical with the wolf is erroneous, and this applies to the Baffinland, Greenland and Labrador huskies, the Siberian and Russian Samoyedes, the inbreds sired by "Chinook," and even to the Alaskan malemutes. As a general rule the so-called Eskimo dogs—Byrd has eighty of them—are short and stocky, averaging about seventy-five pounds in weight when full-grown, with large broad heads, upstanding ears, pointed muzzles, thick, long hair, furred legs, small, compact feet, and a plumed tail that curls up over their backs.

This description also applies in a general way to the speedier Siberians, though they are lighter, not so thick-set, slightly taller, shorter-haired and less quarrelsome. You find quite a mixture of colors among Siberians, and Leonhard Seppala, international champion dog musher and real hero of the famous serum run to Nome, who has bred them for years, thinks they are



Beautiful Head of a Siberian Husky; Fierce When Angered but Loyal and Intelligent as a Worker

descended from the fox rather than from the wolf.

Nor does the husky possess the savagery of the wolf, which is frequently, but unjustly, attributed to him. When abused and half-starved, he can be savage enough, it is true. And he may show some of the savagery of the wolf in battling for his life with other dogs, but he is not a man-eater. The most ordinary kind of decent and fair treatment brings out the nobler traits of his nature, and makes him docile, tractable, and even a safer pet for children than some high-strung thoroughbred dogs of recognized breeds.

The training of huskies to harness begins when they are mere puppies, and is not so difficult as might be imagined, because they seem to enjoy it. The Eskimos of Coronation gulf make complete sets of harness for new-born pups and perform a peculiar ritual over them to endow them with the attributes of a good draft animal.

They pull their ears and bid them grow



Sled-Dog Drivers, All of New England, Who Have Been Doing Great Work with the Byrd Expedition

long and sensitive so that their sense of hearing may be acute; blow into their nostrils to give them the most delicate sense of smell; slap and torment them until they snarl and snap that they may be fierce and savage and able to hold their own in a fray, and stretch their legs one after another praying that they may grow long and sturdy. Then a miniature harness of deerskin is put on the pup and his master pushes him away with one hand and pulls as hard as he can on the trace with the other, telling the dog meanwhile that he must pull like that on the sled when he grows up.

But the white man is more humane, practical and scientific in training his sled dogs, and rarely puts them in harness until they are at least six to nine months of age. Arthur T. Walden, the country's most famous sled-dog musher, who has charge of Byrd's huskies, will take a puppy born in February, for example, and start training him with the first snowfall of the following winter, but never earlier than that. He usually hitches a puppy to a small log of wood to begin with and makes him drag it until he is physically tired, but not to

the point of exhaustion. The weight of the log is increased as the dog's strength and pulling power grow, and later he is hitched to a loaded sledge. But care is taken at all times not to load him too heavily, lest he suffer a strain that may trouble him all his life.

After these preliminaries, Walden hitches a young dog between two old ones, and from his teammates the puppy soon learns to start at the command "Mush," to swing right at the order to "Gee," to the left when he hears "Haw," and to stop when the driver yells "Whoa." Of course some dogs learn faster than others, depending on their degree of intelligence, but the older dogs help greatly in training

the dunces by snapping viciously at them if they do the wrong thing or fail to respond to a command promptly.

As to the pulling power, speed and endurance of huskies, Walden is my authority for the statement that a dog team can go farther and faster on its own food than any other team in the world. Theoretically, a team of seven to nine dogs can travel with one man and a load of 1,200 pounds of food and equipment, a distance of 1,400 miles at an average of better than twenty miles a day.

Nine out of ten dogs will not face a blizzard but are inclined to turn tail and run with it, Scotty Allan once told me. But they can be led into it. So, a good leader must have enough pride and courage of dog blood to keep his teammates nosing into the frigid gale, and enough of the sagacity of the wolf to make him infallible on the trail.

Such a leader was old "Chinook," who twice saved his master's life in the White Mountains of New Hampshire. Many who read of "Chinook's" death with the Byrd expedition may be wondering still why Walden should have insisted on sub-



Glimpse of Antarctic Country, Showing the Rough Ice Fields Byrd's Men and Dogs Must Travel in Their Conquest of the South Pole

jecting such an old dog to the hardship of a venture into the antarctic terrain. Well, the sentimental attachment between the man and his dog is half the answer, and here's the other half:

A few years ago when Walden was attempting to go through Crawford Notch in the White Mountains in the middle of the winter with "Chinook" at the head of his team, a sudden snowslide struck the sleigh, twisted it out of his hands, and swept him down into a deep gully. After a desperate struggle, he managed to get his head above the surface of the snow, but the effort exhausted him, and as his team was nowhere in sight, he had visions of freezing to death there. Meantime the dogs had raced on, but had not gone far, when "Chinook" missed his master's voice and stopped short. Then he turned abruptly about and began to back-trail, fairly dragging his teammates behind him, and baying every two or three minutes until he heard the faint call of his name.

This helped him to locate the spot where Walden was struggling, and on reaching it, the dog maneuvered the sleigh so that

one of the runners came within his master's reach. To it Walden clung and the dogs quickly snaked him out of danger.

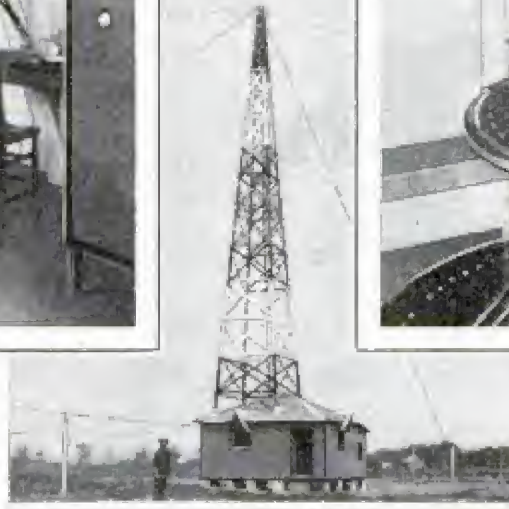
Again, when Walden drove his dog team up the icy slopes of Mount Washington—the stunt they said a dog team couldn't do—"Chinook" got him out of a dangerous situation. On reaching the lower spur of Chandler ridge, Walden found that he had to cross the crest of an ice-covered slope as near to perpendicular as it could be and still give foothold to a man with the sharpest of creepers on.

Downward for a quarter of a mile that slope extended, and when the dogs were halfway across it, the sled began to slip away from the driver and move down that deadly incline. Then the dogs, feeling the weight of the slipping sled, stopped and tried to dig their toes into the ice. By exerting all their strength, they were able to hold their footing, but could not move forward or turn back. For a few minutes they remained tense and rigid, then some of the younger dogs began to flinch under the strain, and turn their heads as though contemplating a downward dash that

AUTOMATIC RADIO BEACON GUIDES PLANES IN FOG



Operating Room Where Signals Are Sent; Center, Aerial Tower from Which Antennae Stretch to the Four Points of the Compass



This Appliance, the Goniometer, Causes Directional Radio Signals to Be Sent to the Point toward Which the Arrow Points

Guiding the paths of aviators from the ground, a radio aerial beacon has been placed in operation at Mitchell field, New York. It can guide flyers from the field within a radius of 400 miles by day and 1,400 miles at night, and has proved valuable in aiding pilots to hold their courses in foggy weather. It is operated automatically by an appliance known as a "goniometer" attached to aerials stretched to the four points of the compass. The aviator is guided by directional signals given after he has sent signals to the goniometer.

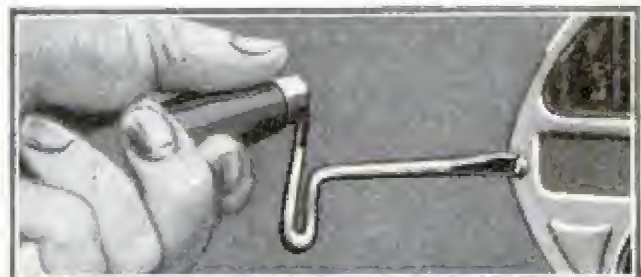
RUM-RUNNING AUTOS DETECTED BY LIGHTS AND MIRRORS

Swimming-pool lamps and angled mirrors serve to detect automobiles carrying liquor at the United States end of the Peace bridge connecting Buffalo and Fort Erie, Ont. Four lanes of entry over the bridge past the custom offices are equipped with lamps sunk into the bridge floor, while mirrors are placed at an angle in the curbing opposite the lamps. Custom officers stop automobiles over the lights

and, while questioning the motorists entering from Canada, are also able, by glancing in the mirror, to see the entire underside of the car. Any covering under the car is examined as a possible cache.

CROOKED SCREWDRIVER SHANK GIVES ROTARY ACTION

Rotary action is given to a screwdriver by a U-shaped crook in the shank with an elongated side nearest the handle, forming an angle between handle and blade which gives an easy action in driving a screw. Small screws can be started without holding and, in many cases, but one hand is required to do the work.

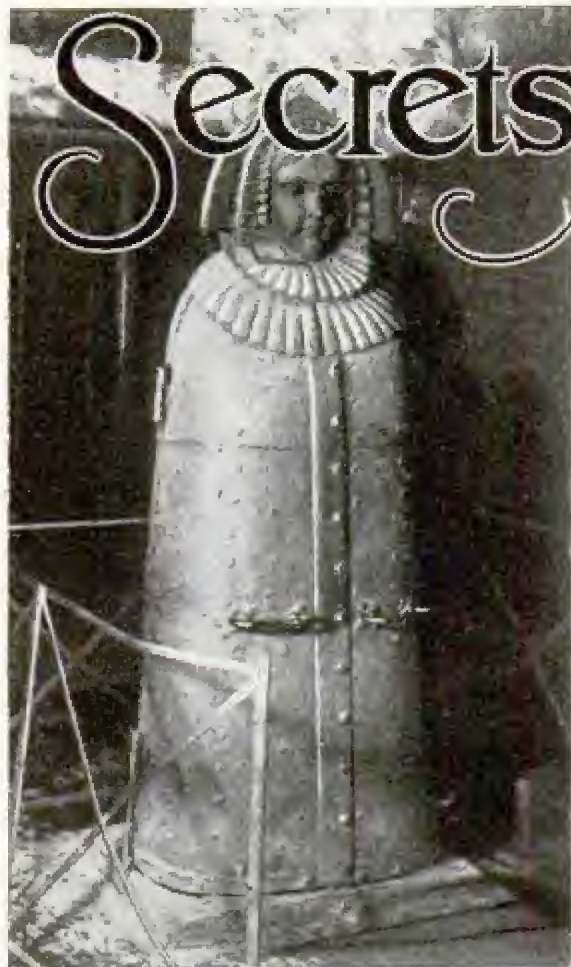


The U-Shaped Bend in This Screwdriver Is Designed to Give It Rotary Action

Com. John W. Under
D. Leming 207

3010
Triangle of security Co.
First Ave. New Kensington

1877 Secrets of Ancient



same captive. He found himself caged in iron from floor to ceiling. He looked up the lofty walls of this vast square cell and saw seven grated windows, heavily barred, set at irregular intervals in the wall, apparently to admit light and air. An iron bedstead, littered with straw, stood in a corner, and a vessel of water and a coarse dish holding coarser food.

The captive fell asleep. When he awoke, he saw a fresh pitcher of water and food in the cell, yet he had not heard a sound of anyone entering. The same thing happened the next night. In the morning, the puzzled captive, looking around his cell for an explanation of the mystery, noticed only five windows in the iron walls. He had left a wisp of straw

By HAROLD T. WILKINS

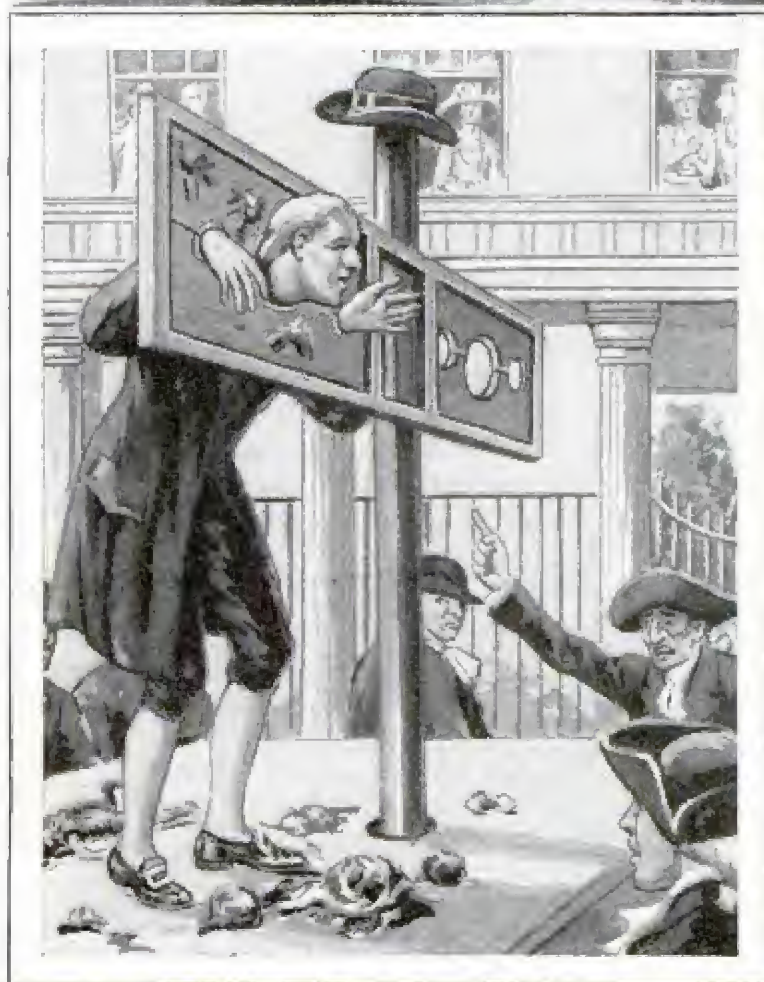
HIGH on a lonely rock, overlooking a bay on the wildest coast of Sicily, there stands today a castle which possesses a torture instrument more blood-curdling than anything imagined by fiction writers. Mention the name of this infamous stronghold, Tolfi, to the Sicilian peasant herding goats in the neighborhood, and he crosses himself with a shudder.

The heyday of this and other similar inventions was in the fifteenth century. At a time when Italy was torn with factions, a band of silent ruffians conveyed to Tolfi castle a bound victim, who had incurred the enmity of the sinister owner. They entered a dungeon cut deep into the solid rock, and passed through great folding iron doors, shut with a triple lock of enormous strength, into an iron cage. These iron doors never opened twice on the



Courtesy Otto Mann
Two Views of the "Iron Maiden," a Favorite Torture Device of Olden Times; Sharp Spikes Pierced the Victim Placed Inside

Torture Chambers



Commonly Used in the Days of Witchcraft, the Ducking Stool and the Pillory of 200 Years Ago

against the folding doors, so that any intruder would be bound to move it away. The straw lay just where he had placed it! Now he imagined that the dungeon had shrunk in size since he had entered it.

This iron prison was constructed as a cubical cage within another cubical cage, twice as large. The walls were thus double. There were two motions, a downward and an inward. The ceiling and walls, operated by a hydraulic engine, imperceptibly moved downward one section each twenty-four hours, masking one barred window of the seven on the iron wall. As soon as the downward



Painless but Based on Principles of the Old Torture Machines; This Apparatus Indicates Emotional Reactions of the Subject by Recording Changes in the Volume of the Arm Due to Inrush or Outflow of Blood to or from the Member

motion was finished, the inward motion began, in which the ceiling and floor dragged the inner walls inward a distance corresponding to one-seventh of their width. By the time the projecting parts of the ceiling and floor were in contact with the outer walls, the victim was dead.

For cruel ingenuity the old-time torture instruments of Europe make the blood of the American tourist run cold. The ancient records tell of the rack and the terrible "veglia," or "vigil." The victim's arms were tied behind his back in such a way that, when he was raised off the ground, the entire weight of the body rested upon the shoulder joints, wrenched violently from their sockets. The torture lasted as long as desired, and then the victim was let down slowly, released, unbound and his dislocated arms resettled in their places. That was the rack, for ordinary torture.

If this did not extract the desired confession, the veglia was applied. This abominable instrument was the invention of Girolamo Menghina of Siena. The victim was first completely shaven. Then the hangman fastened belts round his chest, and ropes pulling at his arms, bound together behind his head. His feet were lashed to a bar, and he was placed on a sharp stone perched on a stool. When

the victim's tense muscles touched this stone, it gave him almost unbearable pain.

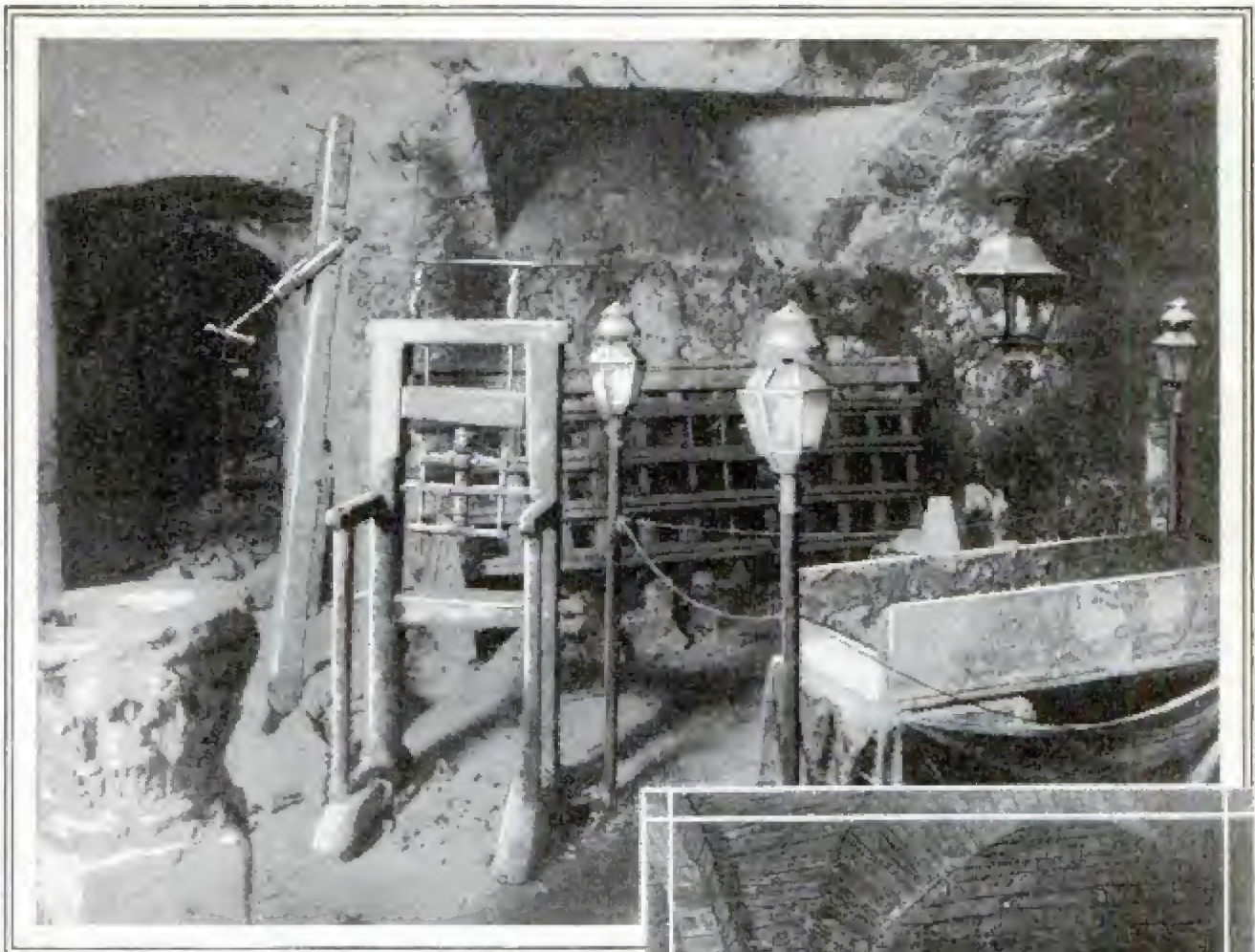
The famous Palace of the Doges, at Venice, has a museum of instruments of torture. In one room of this palace was the famous "Bocca di Leone" (Lion's Mouth) into which anonymous charges were dropped. The terrible Council of Ten investigated the charges and swiftly punished the victims. The condemned man was taken into one of a block of horrible cells—still to be seen. A torch was placed in a loophole of the massive wall, for half an hour every day, to light the prisoner. By its glimmer, he scratched inscriptions on the wall with a rusty nail. In one cell, no man lived more than twenty-four hours.

The ghastly "chebba" hung on the walls of the famous campanile of San Marco, at Venice. The chebba was a wooden cage suspended from a pole, and the culprit was left in it to the mercy of wind and weather, for a day, a week, a month, a year or for life. An Englishman passing that way in the fifteenth century saw a man in the chebba who had been in it for a year.

The mysterious dungeons of old Seville were renowned for infamously ingenious instruments of torture. Some of them were in use when the liberating army of the French Republic swept them to the winds. The grand inquisitor held his court in the deep-vaulted cellar of a vast rotunda lit by two pale torches. A flight of steps led to the torture chamber.

The air of this living tomb was damp, and water dripped from walls, hung with the engines of the rack, the boot, enormous nails and thin and thick cords and gyves. A burning brazier in a corner darted out blue flames.

A prisoner was shown the implements of torture and urged to confess. If he refused, he was stripped and bound, and again entreated to speak, with promises of mercy. If he continued obstinate, he was shown more instruments of torture. Four masked men now tied his hands behind his back. He was to undergo the "torture of the pulley."



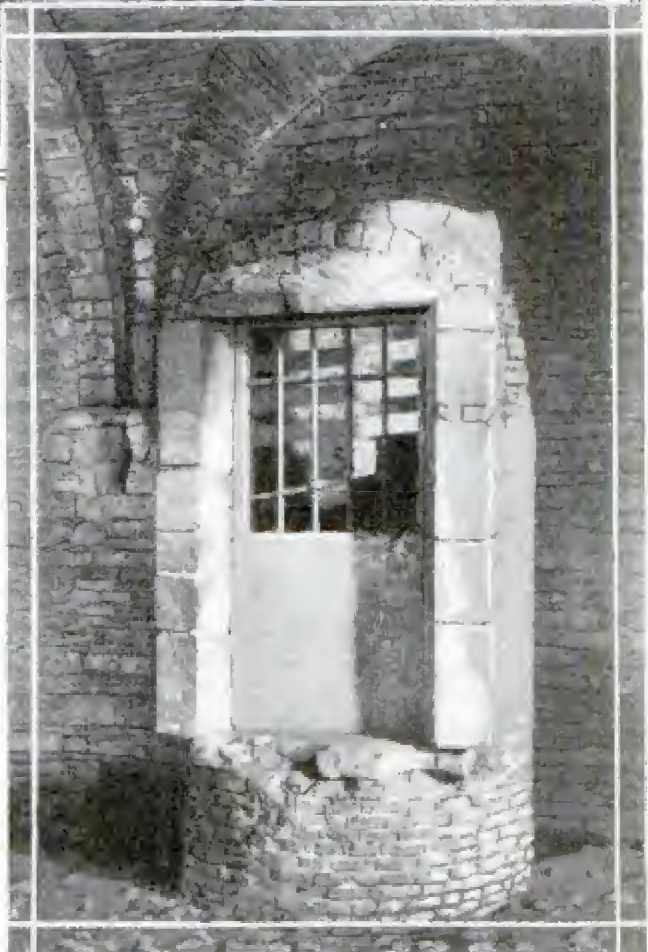
© P. & A.

Torture Chamber Unearthed in the Foundations of the Chancellor's Palace, at Granada, Spain

They suspended him by a cord running over a pulley and block. The executioners pulled hard on the cord and raised the man to the roof and then violently let him down within a few inches of the ground. His nerves were all taut and tense, and he expected to be smashed to pieces. He swooned, but as soon as he opened his eyes, the hangmen resumed the torture.

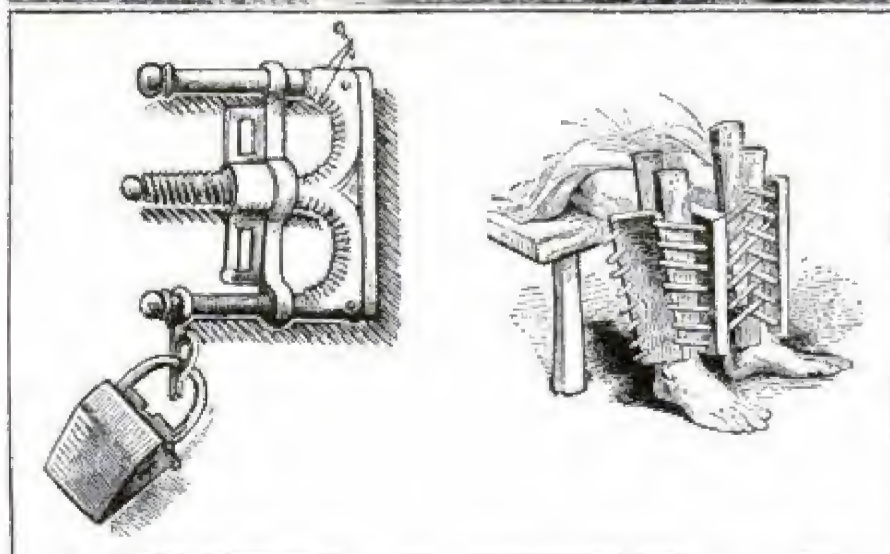
A repetition of the torture might be ordered, but any confession made under torture had to be confirmed after the victim had been removed from the torture chamber. As a rule, the torture was continued until the man or woman signified readiness to confess, when he or she was unbound and the confession was taken down in another room.

Another diabolical torture of the Spanish inquisition was known as the "water torment." The victim was first pinioned on a rack. A fine cloth, saturated with water, was placed over his face. One part of the cloth was introduced into the



Well That Supplied Water for Torture Ceremonies in the Dungeon of the Castle at Ghent, Belgium

throat, the other covered the nostrils. Drop by drop, out of a funnel, the water trickled slowly across the saturated linen,



The "Five-Cornered Tower" at the Castle of Nuremberg, Germany, Where the "Iron Maiden" Was Kept, and Drawing of Thumbscrew and Boot

until presently the victim found it hard to breathe and simultaneously swallow the drops of water.

The Duke of Shrewsbury once arranged a remarkable exposition of instruments of torture in London. He had bought them at the royal castle of Nuremberg, Germany. Among them was the terrible "Iron Maiden." The face of a sphinx looked out from the exterior of this figure, which was a strong wooden sarcophagus, tied together with iron bands. Set in the walls of this instrument were two

doors, opened to allow the prisoner to be placed inside. The whole of the interior was fitted with long, sharp iron spikes, so that, when the doors were pressed shut, these prongs entered the victim's body.

The same exposition showed the Spanish "Donkey," which cut the body into halves; the wheel on which criminals were broken alive; the small lever with a sharp-toothed thumb and finger screw; the ducking cage for bakers found giving short weight; a pair of iron pincers with a screw for tearing out tongues; the Spanish mouthpiece or gag; the copper mask worn by the judge of the German robber barons; stretching gallows; garters to torture legs; mouthpieces for slitting the tongues of blasphemers; sieves through which boiling oil was poured on the victim's body, and iron gloves made hot before being put on the victim's hands.

American visitors to the "White Keep" of the Tower of London are shown a subcrypt or vault, today lighted by electricity, whitewashed and well ventilated, but

at one time a foul torture dungeon. In the old days of "Merrie England," the prisoners in the Tower descended a tortuous stone staircase, following the hangman or executioner who carried a candle whose dim light made the dark shadows more gloomy. Once in the dungeon, the victim's eyes fell on the instruments of torture ranged round the walls, and the doors, which were made thick to drown the cries of the tortured.

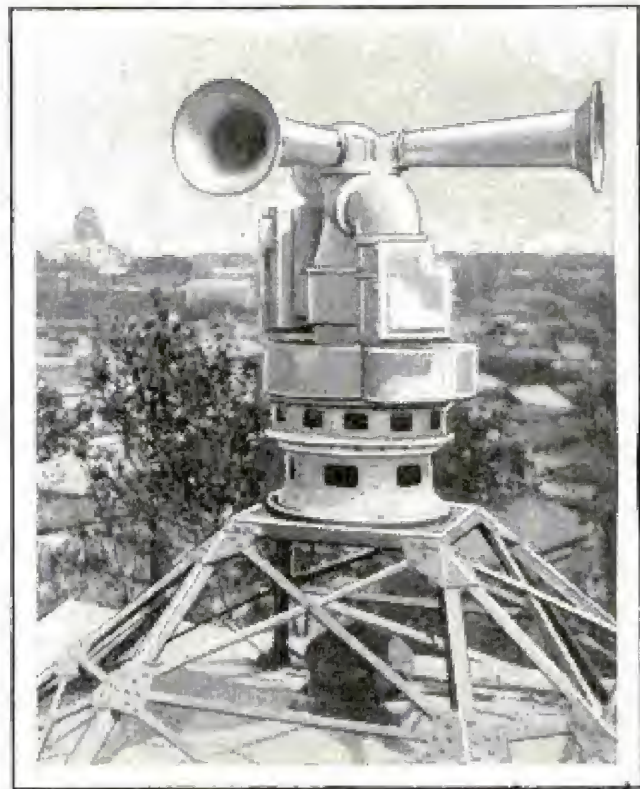
Opening into the torture chamber was the dungeon of "Little Ease," where a

prisoner could not even lie down on the cold flagstones, but had to maintain a squatting posture for days at a time. Neither light nor fresh air was admitted to the dungeon. Underneath it lay another great dungeon with no airshaft and in absolute darkness. In these damp, airless surroundings, 600 wretches were penned up in a place without standing room for 250 persons. They had no water, no food and no sanitary arrangements.

At the Tower there is still kept the "cravat" or engine for locking the hands, head and feet together, and nicknamed the "Scavenger's Daughter." This was made in two parts, with a broad hoop of iron fastened by a hinge. The prisoner had to kneel on the pavement and contract his body into the smallest possible space. Then the executioner knelt on his shoulders, introduced the hoop under the victim's legs, and compressed the victim closely until he was able to fasten the ends of the iron hoop over the small of the back. The time for this torture was one and a half hours, during which period the pressure of the infamous device made the blood gush from the nose, or, even, it was said, from the victim's hands and feet.

As late of 1750, a pirate tried at the Old Admiralty courts of England, refused to plead guilty to the indictment and was taken back to prison to be "pressed to death." This savage punishment was known as the "peine forte et dure," and under it a man was loaded with iron weights and pressed to death.

Stone chests with a bottom covered with sharp iron spikes are still to be seen in the manor house of Pucklechurch, Gloucestershire, England, wherein serfs were shut down and pressed to death by robber barons in the "good old days." Secure within their moated castles and thick-walled keeps, these robber barons hung peaceable folk up by the feet in volumes of smoke to make them confess where they had hidden their money.

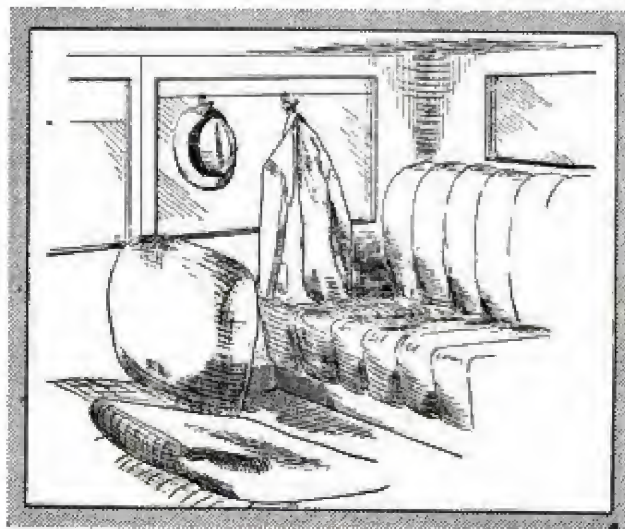


This Huge Siren atop a Tall Building Serves Residents of Tokyo as a City Clock

SIREN SERVES AS CITY CLOCK REPLACING CANNON'S ROAR

Residents of Tokyo, Japan, in future will listen for the shriek of a siren instead of the roar of a cannon when they desire the correct time. A huge siren has been erected atop a tall building to signal to the city the hours of the day. It replaces the firing of a cannon at a near-by army post, which was discontinued by imperial order, as being a less distinctive sound than the shrill blast of the siren.

AUTO SERVES AS A WARDROBE WITH HOOKS ON DOORS



Hangers Adjusted on Auto Window Pane

Hat and coat hangers and other hooks that are easily slipped over the automobile windows, have been introduced to increase the usefulness of the car on camping or touring trips. They do not interfere with the opening or closing of the windows and may be removed quickly.

Frank Saxton
old man

3030
 Mr. Jean Vignaud.
 10, rue de la Jette, France



Model of Ocean Liner, Which It Is Claimed Can Cross the Atlantic in Thirty Hours

CROSS OCEAN IN THIRTY HOURS ON LINER OF THE FUTURE

Crossing the Atlantic in thirty hours is claimed as a possibility by the inventor of an ocean liner somewhat resembling a cross between a large steamship and a giant dirigible. A model of the queer-looking craft has been undergoing tests off the coast of France to determine speed and endurance.

"BOOTLEG" PLANES ARE BUILT FROM OLD WRECKS

"Bootlegged" airplanes, imitations of well-known makes but not licensed, and unsafe ships that have been reconstructed from the wreckage of other planes, have been discovered by inspectors of the aeronautics branch of the department of commerce. They warn prospective buyers to be on the lookout for such craft. To get possession of the license numbers and name plate of the manufacturer, an unscrupulous agent may purchase a wreck at a greatly reduced price and use the tags on

an unlicensed ship or employ parts in making a plane. Inspectors refuse to license such ships, but unwary customers may be deceived by the presence of the plates. Inferior parts, closely resembling those that have received official approval, are likewise used in some bootleg planes. The practice is dangerous, as such a ship may be unsafe, although, to the eye, it appears well constructed, inspectors point out. To curb the traffic in these airplanes, most ships are now licensed at the factories. Record is kept of all numbers allotted, so that any plane of a particular make, not already licensed and entered on the government list, may more easily be discovered. The detection of dangerous planes and the examination of pilots for licenses are two of the important duties of the inspectors of the service, in their efforts to promote safety in aviation.

FARMER RIDES WALKING PLOW WITHOUT MAKING TURNS

Turning at the end of a furrow is eliminated in a two-way walking plow to which may be attached a seat and appliance enabling the plowman to ride. The implement is fitted with two points set in opposite directions, and the moldboard is on a hinge with two faces, so that it can swing around. At the end of the furrow, the horses are turned on unplowed ground. This swings the beam and handles on a swivel. A chain attached to the handle flips the moldboard to the opposite side and the plow is ready to start back. This causes less waste of ground from dead furrows and from the trampling of the horses at the ends of the field as well as making unnecessary the dragging about of the plow.

A seat may be attached to the plow which then is held upright by a shoe running along the unplowed ground at a distance of about two feet, being low enough to allow the beam to swing over it when turned. The maker says it is both lighter and less expensive than a wheeled plow.

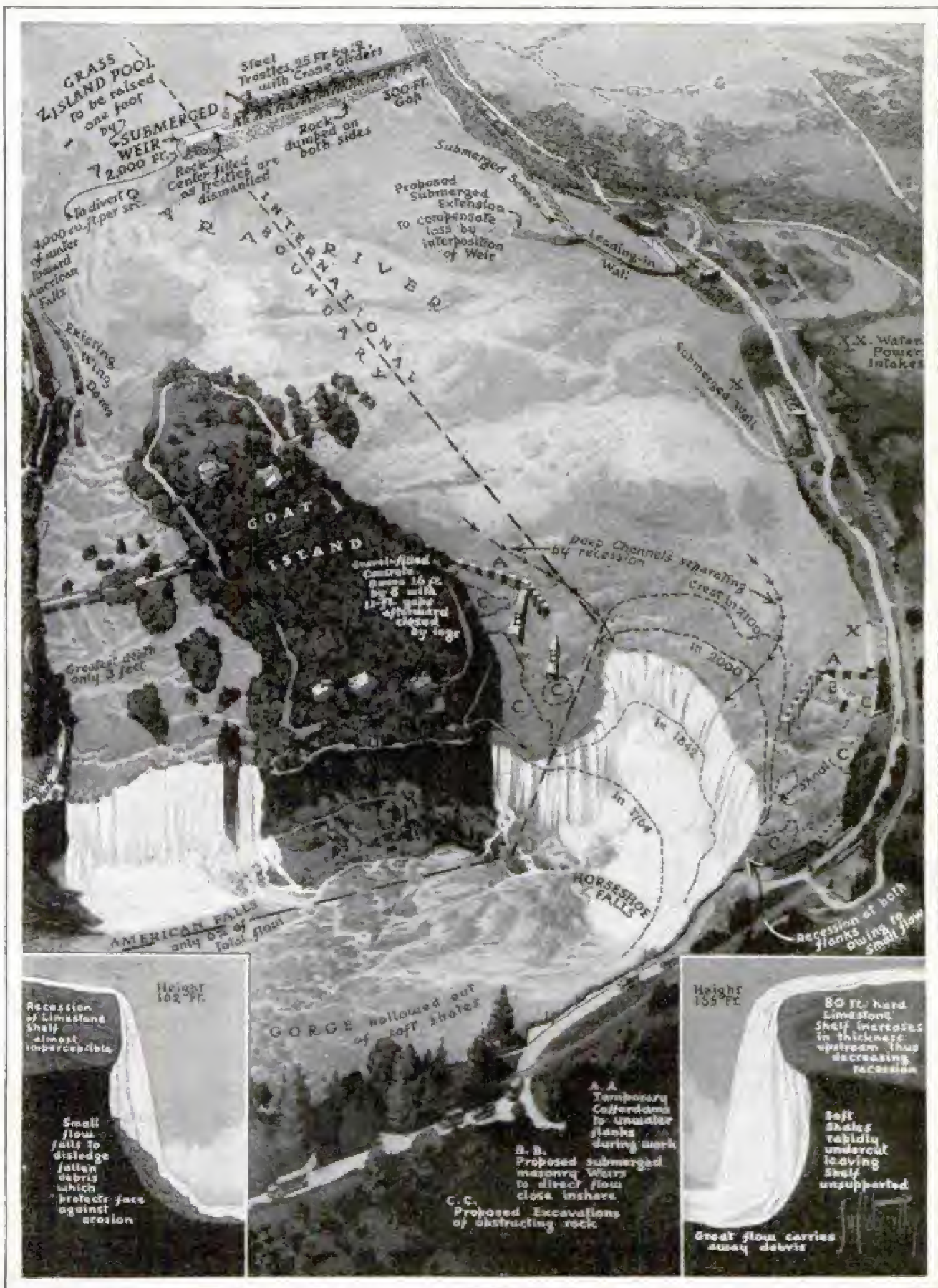


3046
 Emerald & Ryher

Aviation 6/25/29

3041
 Mr. J. H. Porter
 348 N. Fourth St.
 St. Paul, Minn.

AMERICA AND CANADA JOIN TO PRESERVE NIAGARA

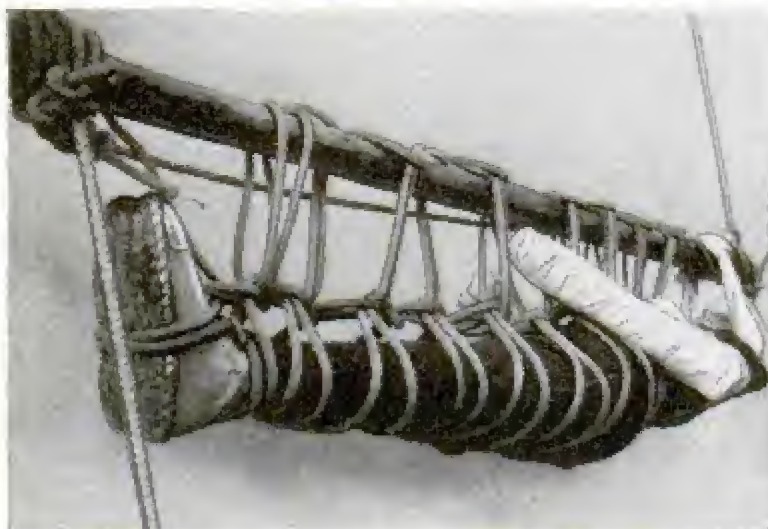


Copyright, S. W. Clatworthy

Drawing of Airplane View of Niagara Falls, Showing Various Works Now Being Erected with Double Object of Obtaining Water Power without Further Marring the Beauty of the Cataract

18. Shakespeare Road
Hill London.

STRETCHER OF POLE AND ROPE USED IN MOUNTAINS



Injured Alpine Climbers Are Borne down Slippery Trails on This Stretcher, Improvised from a Pole and Rope

Mountain climbers faced with the necessity of carrying a disabled comrade down the slippery trails to lower levels, may have their task facilitated by improvising a stretcher from a pole and piece of rope. At the Dresden travel show recently, demonstrations were offered of how an injured person might be trussed into a comfortable position to be borne on the shoulders of his fellows. The rope is so wrapped and knotted as to provide a swing for the body suspended from the pole.

HIGH-SPEED AIRPLANES TIMED BY CAMERA AND CLOCK

1. ing the terrific speeds anticipated in the international airplane races for the Schneider cup was a problem solved finally by combined use of a movie camera and a master clock. The automatic timer is made by adjusting camera and clock so that electrical impulses from the clock on a tape are photographed simultaneously with passage of the plane across the film and through a ring of circles interposed between lens and film. This method was used when a British flight lieutenant made a speed of nearly 320 miles an hour, with the difference that stop watches were used inside the cam-

eras and were photographed with passage of the plane into the measured distance.

Possible fractional errors between two stop watches were eliminated by using the master clock. Previously, a timer pressed a stop watch after sighting the aircraft along two marks, a method found to be inaccurate for high speeds. Automobile-timing devices, including that of an electrical clock impressing dots on tapes at each end of the course, or recording on a photo-electric cell as the shadow of the car in passing broke a beam of light, were found wholly impracticable for the air races.

MOTORCYCLE ON SKIS REPLACES DOGS

Eskimo dog teams in Alaska are losing out to progress with a motorcycle on skis skimming over the ice and snow that the huskies once traveled. It has replaced dog teams in delivering mail and supplies and obtaining furs at isolated outposts of an Alaskan trading company. The dogs took three weeks for the trips that the motorcycle is expected to accomplish in two days, and, besides, the dog sleds were so heavily loaded with fish for the animals that there was little room for a pay load. The skis are wide enough to support the weight of the machine and to pack down snow to a hard surface for a rear power wheel, which is equipped with heavy skid chains for traction. The machine also will carry the sick from trading posts.

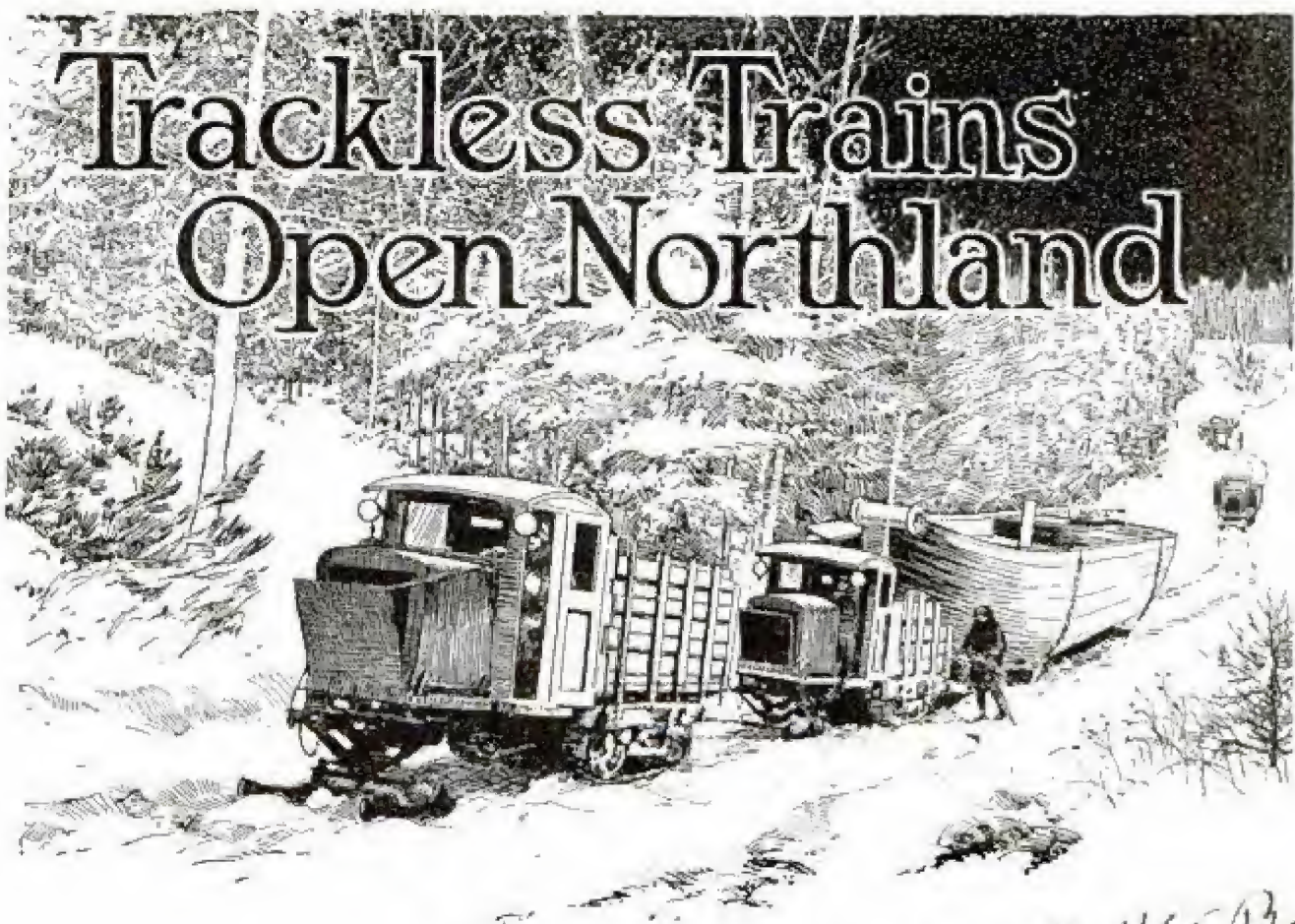


Alaskan Dog Teams Mushed for Three Weeks over a Trail Covered by This Motorcycle on Skis in Two Days

Harley-Davidson Motor
Co. 3732 Juneau

Cont. H. J. Williams, Colombering
29 Bear's Road, Bentley 30
no longer
Ludger
England
Heath

Chicago 1507 S. Michigan



By JAMES MONTAGNES

*R. 304, 4650 Bay St.
Toronto 2 Ont.
Can*

A HORN honks. The northland express is off. Ahead, a trail of snow and ice; on both sides, trees as far as the eye can see. Furrows in the snow tell of a previous trip. A dip in the road and a vast expanse of frozen water. Snow-clad trees on its banks. Off the water the road continues. More lakes, more bush, some cabins in the distance. The train stops, the cars are unshackled, empty ones are placed behind the engine and the driver is ready to turn back.

All winter that continued. No smoke marred the horizon, no rail track ahead, no telegraph wires alongside the road. For the northland express consists of a tractor, a powerful engine pulling behind it six immense sleighs and a caboose. Over ninety miles of bushland road and frozen lake the express trundled its way. Only a telephone wire stretching in solitary silence high enough so that no wandering moose might entangle its horn in it, keeps the train in communication with either end of the road.

A copper mine whose wealth is estimated at hundreds of millions of dollars

needs electricity to bring the rich ore out of the ground and make it a commercial commodity. Seventy-five thousand horsepower is required to operate the drilling machinery, the smelters and all the apparatus used in a modern mine of such potential wealth. A town site for 5,000 people must be lighted and run on a modern basis. For these purposes, a tractor is plowed through the northland every day and every night through snow and wind.

The mine is at Flin Flon, Manitoba. The power site is on the Churchill river at Island Falls. Ninety miles separate the two places. A single line of steel just completed connects the mine with The Pas, ninety miles to the south. Over 400 miles separate the mine and Winnipeg, the nearest big center.

No train on steel rails runs north of Flin Flon to Island Falls. To put one in would take too much time. So wood choppers went north, and a road was cleared through a purely Indian country. Then came the snow. The lakes froze. More snow, and where gravel had been dumped and felled trees had been laid to strengthen

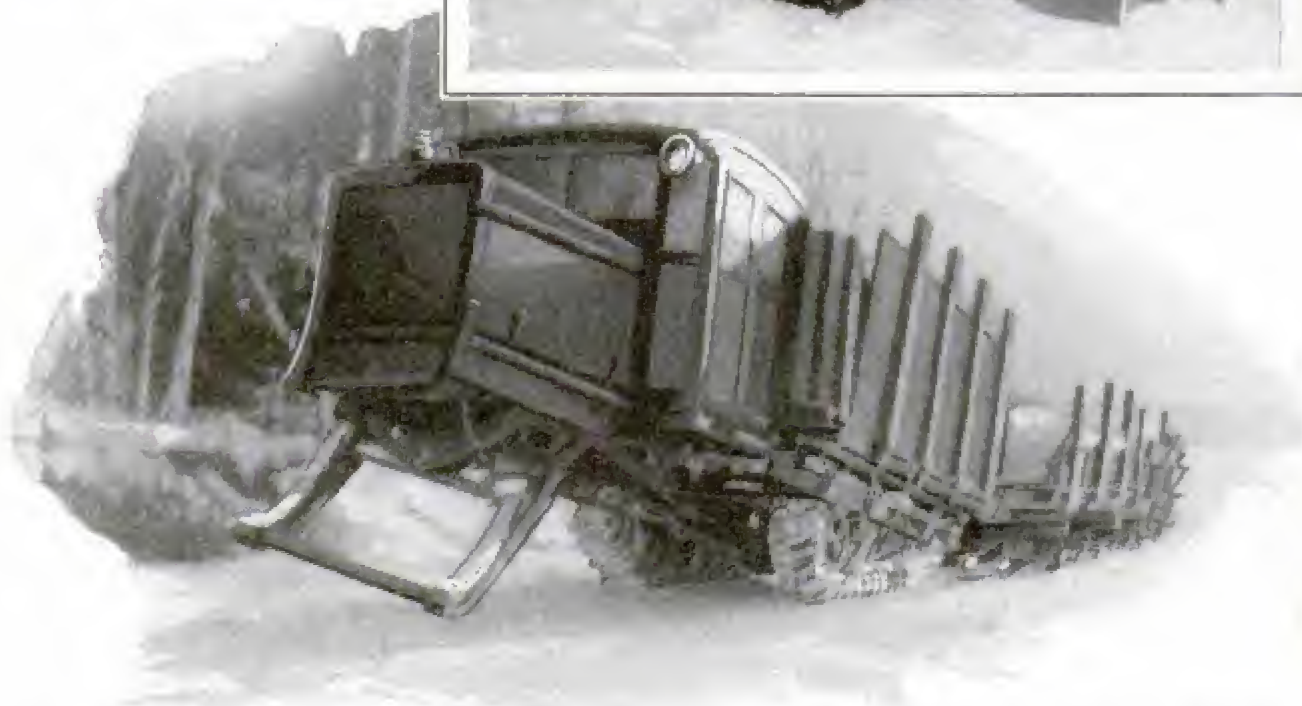
the soft soil, a trail through the wilderness was practically ready for use. With a heavy V-shaped shovel before it, the first tractor train set out. It had to clear the road for those behind. With one sled behind it and a carrying load of twenty-five tons, it made its way through the white country to where the engineers were busy at Island Falls.

In all 23,000 tons were shipped by tractor train from the railroad siding at Flin Flon to the power site at Island Falls—an immense undertaking. But it was simply a problem for the engineers in Winnipeg to solve. They did so with the result that work progressed in weather which hovered around thirty-five degrees below zero all the time and often went down to fifty-three degrees and lower. Snowstorms or fair weather, the road was kept clear while the tractor trains hauled their loads with the regularity of the Twentieth Century.

There are other jobs in Canada where the tractor is replacing the railway. Several years ago, up in northern Quebec, a storage dam to hold ninety-five billion cubic feet of water had to be built. There were no roads north of the little town of Maniwaki. They were built in.

The job was completed and those roads today are serving for another similar undertaking, though not of such vast extent, 110 miles north of Maniwaki. The contractors were given a year to take in 1,000 tons of supplies for a storage dam for the Canadian International Paper company. The order is not very large, at least it doesn't seem so compared with other orders. But the road which had to be cut through some forty miles of virgin forest led through a mountainous country so that a straight trail was hard to plan. And another forty of the 110-mile trip led across water.

The contractors decided to use two tractors on the job and an aeroplane to supervise the work. They started last summer. They had to put in telephone lines for dispatching their tractors and carrying on communication. They had to get barges which could take the heavy tractors over the lake. During the freeze-up and the spring thaw, ways and means



Powerful Endless-Tread Tractors Are Adapted to Haul Loads and Clear Roads of Heavy Snow; Note the Runners in Front to Help Keep the "Engines" of the Trackless Trains on the Trail

id to be devised for using every available way to complete the contract. In summer, the tractor could take six tons. In winter, when the lake was frozen solid, as much as ten tons could be carried. The thousand tons will be in there before the last day set down in the contract.

Trains, busses and aeroplanes operate on schedule on this continent. Their timing is to the minute. And in the north-land the tractor on a construction job takes the place of other means of transportation, operating on schedule. On one job in northern Quebec, the tractor stopped every five miles. Its driver would jump out, go to a near-by tree, take down the telephone receiver and call up the head office to let them know he was reaching his destination. Traveling in this way, a thorough check was kept on the movement of every tractor train.

Even the oldest company on the North American continent, the Hudson's Bay company, which was granted its original charter in 1670, is going to use the tractor to save a voyage of several thousand miles through the Arctic ocean past Alaska and so down the Pacific to Vancouver, by a 200-mile tractor trail near the northern part of Hudson bay. There is a channel of water known as the Fury and Hecla straits, where the ice flows swift and in broken fragments. This narrow waterway, only some seventy-five miles long, is the only southern outlet to the east for all the furs of the western arctic. Its navigation difficulties have necessitated the long trips to Vancouver.

To Wager bay at the northern end of Hudson bay, over bleak barren rocky country, the tractors will come out of the north loaded with furs. They will arrive from Cockburn bay, on King William island, where a fur post is being erected. To this new post will come by dog team the furs of the western arctic archipelago, and there they will be loaded onto a tractor which then starts south to Wager bay. Here boats or tractors, depending on the season, will take the valuable furs south to Fort Churchill, the northern terminus of the new Hudson Bay railroad. And by fast express they will travel to Winnipeg, Montreal, New York and London, fully six months ahead of their former arrival at the world's markets.

3012



Tennis Umpire Operating Automatic Scoreboard by Electrical-Control Device, and Announcing Decision over Microphone

ELECTRIC SCOREBOARD KEEPS TENNIS GALLERY POSTED

Tennis umpires on the Wimbledon courts this year announce their decisions over the microphone each time a point is scored. Simultaneously they mark up the score on a distant board by means of an electric-control knob placed beside the high stand on which they sit.

BOTTLE WASHER FOR HOMES FITS SMOOTH FAUCETS

For water faucets which have no screw threads for making attachments, a threaded faucet coupler has been devised.



It consists of a rubber lining which is twisted onto the faucet and about the outside of which is a metal screw thread to which may be attached a hose for

running the hot water wherever needed. A bottle washer is made to attach to the faucet coupler.

Grass Woods Mfg. Co.
345 Eldert St.

3053
414

Springfield Pool
Phila

Chicago
6/14/29



Diving off a Springboard inside an Auto Tire Provides New Thrills for Bathers

SWIMMERS GET NEW THRILLS FROM OLD TIRES

Automobile tires, always a source of fun in the water, are being used to give divers an extra thrill. The tire is carried to the edge of a springboard, where the diver kneels inside it, bracing himself with feet, knees and shoulders against the inner rim of the tire. The tire with the diver inside then is rolled off the springboard.

PAINTED PROPELLERS FLASH DANGER SIGNAL

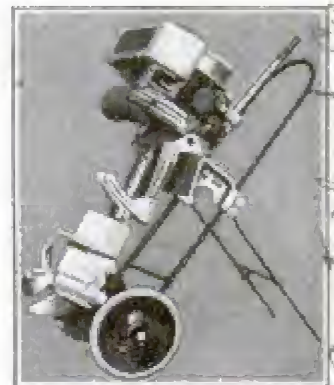
Propellers of airplanes are being painted in brilliant hues to protect thoughtless persons visiting an airport from walking into the whirling blades. The circle of color of the revolving propeller attracts the eye and serves as a warning. The practice was started after it was found that erecting barriers about planes at airports did not prevent a few stragglers from getting past and walking into the path of danger.

SKYSCRAPERS SWAY IN WIND MEASUREMENTS SHOW

Strong gusts of wind against tall steel buildings cause the structures to sway and vibrate, tests have shown. According to reports, two of the tallest buildings in New York city bend as much as six inches at the top of their towers, three inches in either direction from the neutral or fixed position. Designers of a tall building soon to be built in Chicago allowed for a sway of two inches in either direction. A wind of about 100 miles per hour exerts a pressure of approximately thirty pounds to the square foot, and its effect on a high tower, when it blows in irregular gusts, is to cause the steel to vibrate or shake somewhat like a spring-steel bar when it is struck a sudden blow. Elaborate methods of wind bracing are employed in erecting tall steel buildings, one of the means used being the triangular pieces of steel commonly seen where girders join. These are known as gusset plates and were developed by the late W. L. B. Jenney, famous Chicago architect who built the Home Insurance building, recognized by some authorities as the world's first skyscraper. Due to the action of the tower sway upon water in tubs, pictures hanging on the walls and other movable objects within the building, exaggerated ideas have been formed as to the extent of sway. A slight tremor will set up a more pronounced action in such objects, but their motions do not give an accurate measurement of the sway of the building.

TRUCK FOR OUTBOARD MOTOR 2835 KEEPS IT UPRIGHT

Installing or removing the outboard motor is simplified with a rubber-tired truck that saves carrying the engine and keeps it in an upright position. The conveyor is made of metal, allows the motor to be handled while hot, is always ready for service and takes little space.

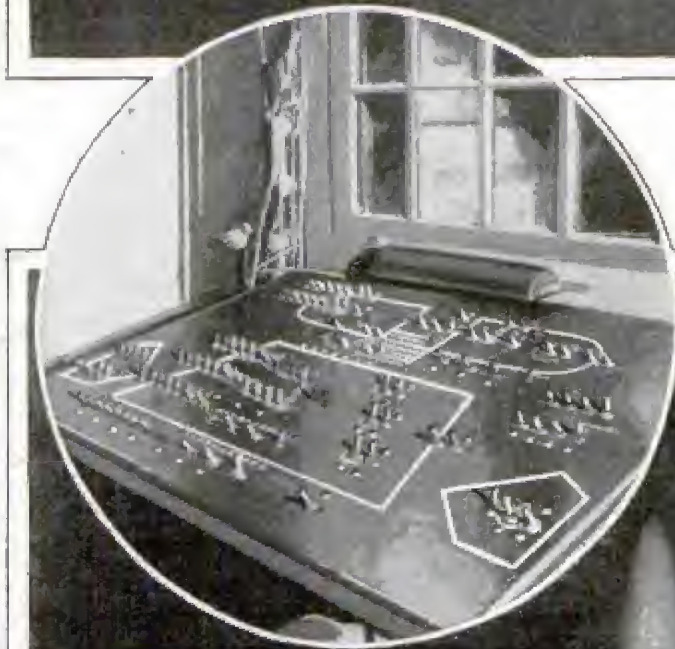


The Motor Boat
Company Co.

Anatone 2/9/29

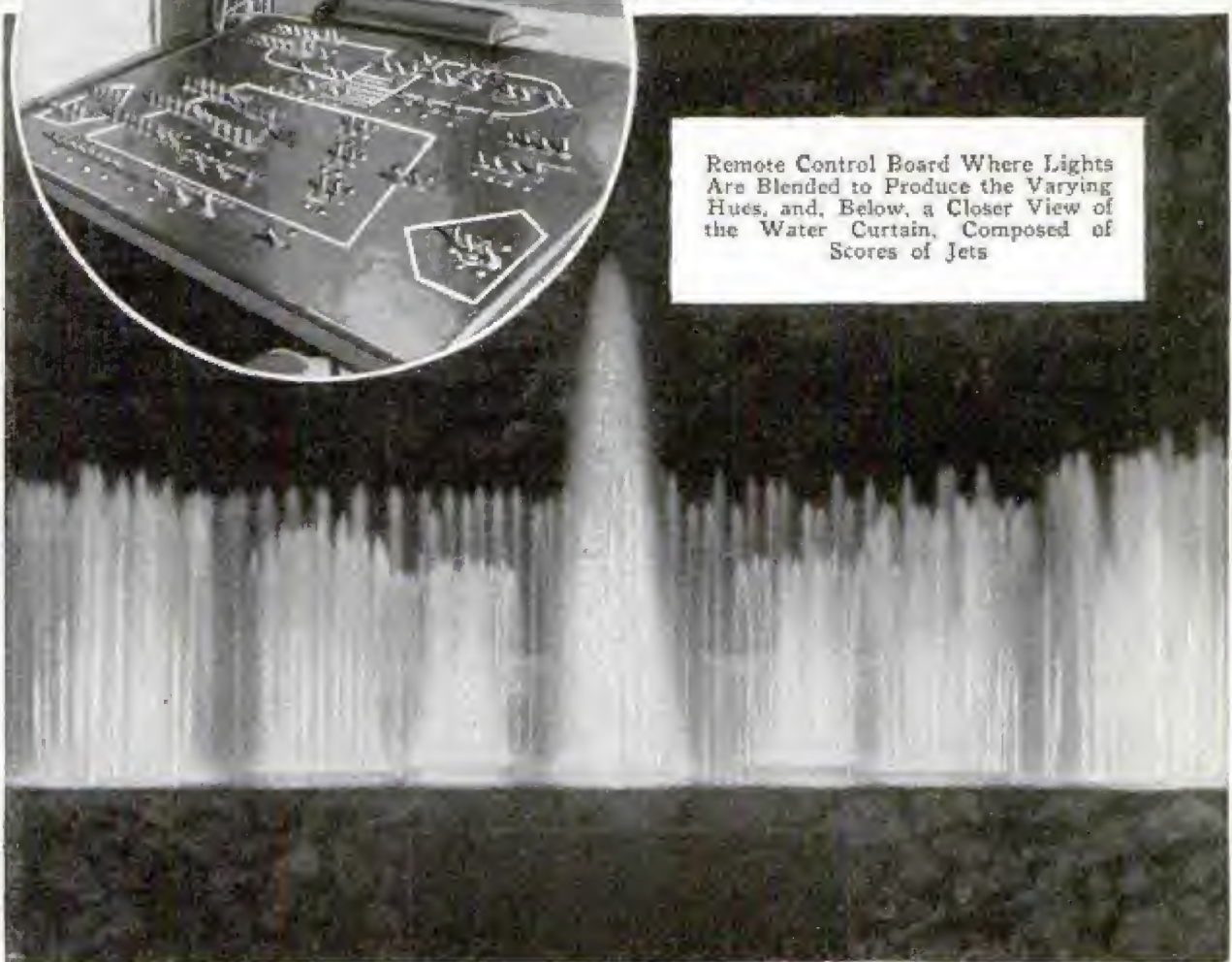
The motor boat conveyor Co. 2835

OPEN-AIR THEATER HAS COLORED-LIGHT CURTAIN



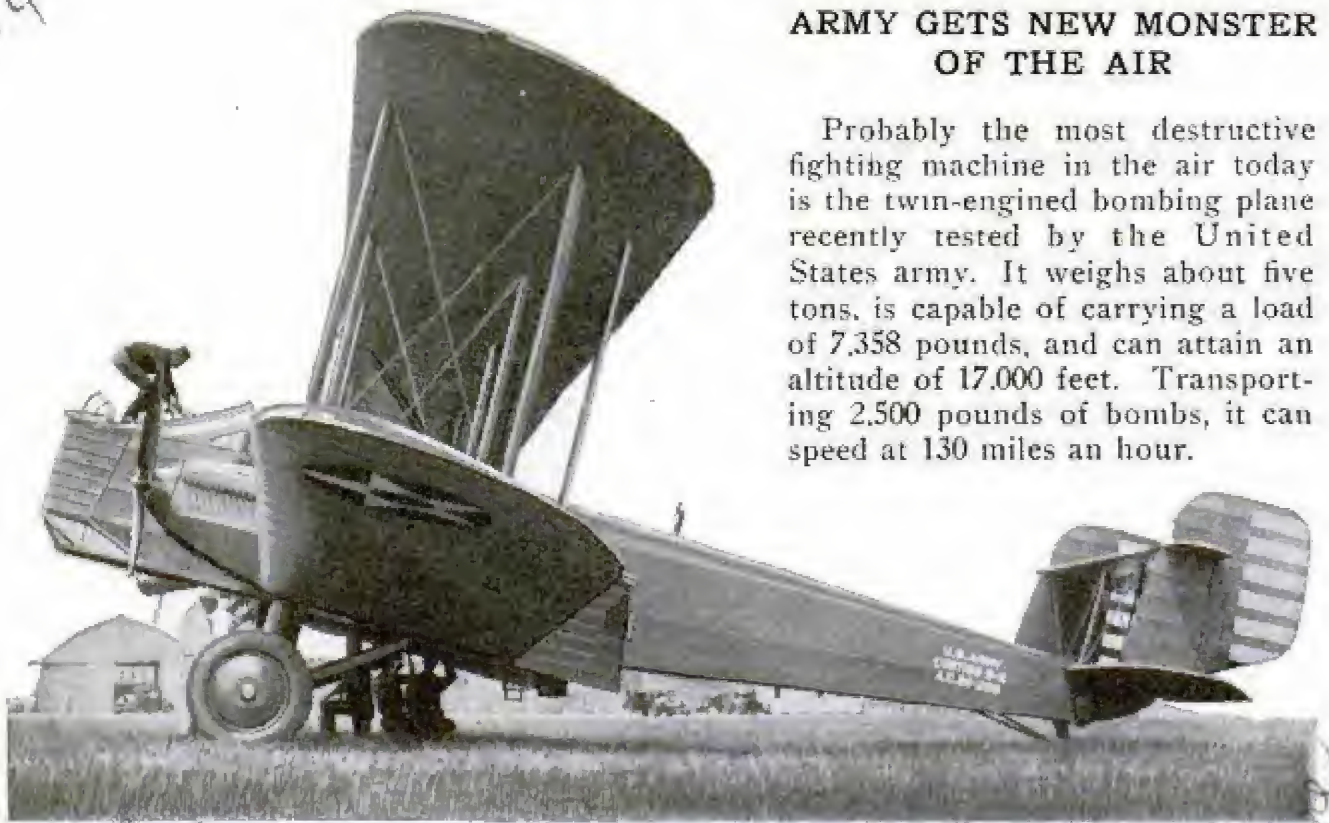
Fountains That Serve as a Curtain for the Du Pont Outdoor Theater near Washington, D. C. Arching Trees and Side Columns of Water Suggesting the Proscenium of a Stage

Remote Control Board Where Lights Are Blended to Produce the Varying Hues, and, Below, a Closer View of the Water Curtain, Composed of Scores of Jets



ARMY GETS NEW MONSTER OF THE AIR

Probably the most destructive fighting machine in the air today is the twin-engine bombing plane recently tested by the United States army. It weighs about five tons, is capable of carrying a load of 7,358 pounds, and can attain an altitude of 17,000 feet. Transporting 2,500 pounds of bombs, it can speed at 130 miles an hour.



Capable of Carrying 2,500 Pounds of Bombs at 130 Miles an Hour, This Twin-Engine Army Bomber Probably Is the Most Destructive Fighting Machine in the Air Today

AUTOMATIC CARBON REMOVER WORKS AS CAR RUNS

Utilizing the breeze created while riding to clean spark plugs is the principle behind an automatic carbon remover which its makers say frees any motor of carbon and keeps it clean. An exhalator attached to the front of the radiator scoops up the air, forcing it through a cartridge containing a saturated material which forms harmless, odorless vapors as the car travels. The vapors are in turn led through a tube into the air stream going into the carburetor, promoting combustion of the carbon, the waste from which is expelled through the exhaust. The action is purposely slow to prevent chunks of carbon from getting under the valves. The only replacement necessary is the cartridge which is renewed every 500

miles. Manufacturers say that, aside from removing carbon as fast as formed, the appliance also saves fuel and oil.

BRITISH INVENTORS SET RECORD

British inventions reached their highest mark in 1928 when the patent office received 38,556 applications. Particular activity was shown in connection with loudspeakers, speaking films and electrical reproducing devices, and many appliances were patented for picture telegraphy and television. Much attention was devoted to low-temperature carbonization, automatic electrical machines and telephones and electrical heating for domestic purposes. Improving the propulsion of air and sea craft was the object of many patents. Women applied for 382 patents, compared with 348 in the preceding year.



Attached to the Radiator, This Automatic Carbon Remover Utilizes the Breeze Created by the Car

Report of
Comptroller

Carb & Chemical Co. Inc.
West End, N.Y.

Carb & Chemical Co. Inc.
West End, N.Y.

MELT GRANITE TO SAVE LABOR IN MOVING BUILDING

To save the tedious labor of chiseling away granite foundation blocks on which rests the county morgue at Pittsburgh, Pa., contractors planning to move the structure melted the granite rocks. The chiseling operation would have required two months, but the granite was transformed into molten lava in less than one month. An oxygen welder first was applied to the granite, eating out a small hole, after which a steel pipe attached to an oxygen tank was inserted in the hole and oxygen released into it. When the pipe started to melt, chemical reaction also served to melt the granite.

NAIL SET IS SELF-CENTERING TO SAVE WOOD FINISH

Driving finishing nails home without marring the wood may be accomplished with a self-centering nail set which automatically adjusts itself over the nail head for the final blow to sink the nail into the wood. The appliance consists essentially of a steel tube at the bottom of which is a conical guide that performs the centering.



Inside is a plunger, attached to a spring and terminating at the bottom in a cup-shaped point to fit all finishing nails. The tool is capped over the head of the nail and the plunger given one blow with a hammer, saving time, fingers and wood finish.

LOUD SPEAKER CALLS DOCTORS

Doctors of a Rochester, N. Y., hospital can play tennis without neglecting their patients. A loud speaker has been placed on the cornice of a staff dormitory adjacent to the courts, and when one of the doctors is wanted, his name is called by the telephone operator at the hospital, and plainly heard on the court.



Workmen Placing Electric Lights for Exterior Illumination of Famous St. Peter's Cathedral

ST. PETER'S DOME IS LIGHTED WITH ELECTRIC LAMPS

Thousands of electric lamps were used to provide exterior illumination for the famous cathedral of St. Peter's in Rome recently. The occasion for the outside lighting of the old church was the beatification of Don Bosco, an Italian priest and educator of the nineteenth century.

WRITING PAD FOR YOUR AUTO HOOKS TO STEERING POST

For use of the business man, and others who transact business from automobiles, a writing pad, which attaches to the steering post of the car by a hook, has been developed. The holder contains a clip for securing the pad, road map or other papers the autoist may desire to have exposed before him.



Strom's Mechanical
Cmt. 211. George W. Corner

Wagon Harness
Duff Co.
1121 12th St.

Portland Ore

2874

Comp. A. A. Allen
25 Park Place
New York

Schools for the



importance of scientific methods in police work, created a highly efficient scientific laboratory where evidence is minutely examined.

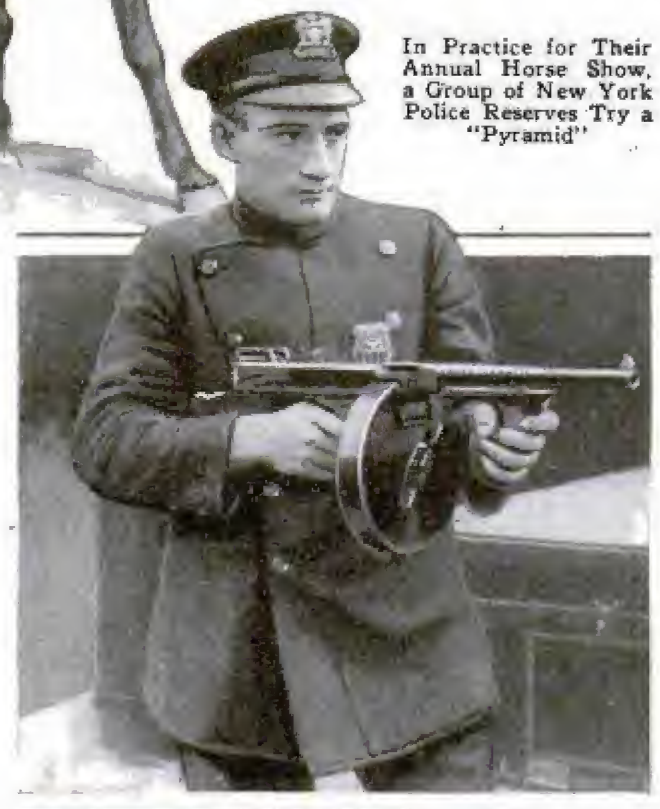
Detroit and other police departments, keeping step with crime, are equipped with supermicroscopes that reveal the telltale marks on bullets, gun barrels, shells and other objects, resulting often in the solution of crimes that otherwise probably would have gone unpunished. Just recently, a photograph of a shell, picked up at the scene of a murder during a holdup in Detroit, led to the arrest of a suspect, his confession and execution in Pennsylvania on a previous charge.

In Practice for Their Annual Horse Show, a Group of New York Police Reserves Try a "Pyramid"

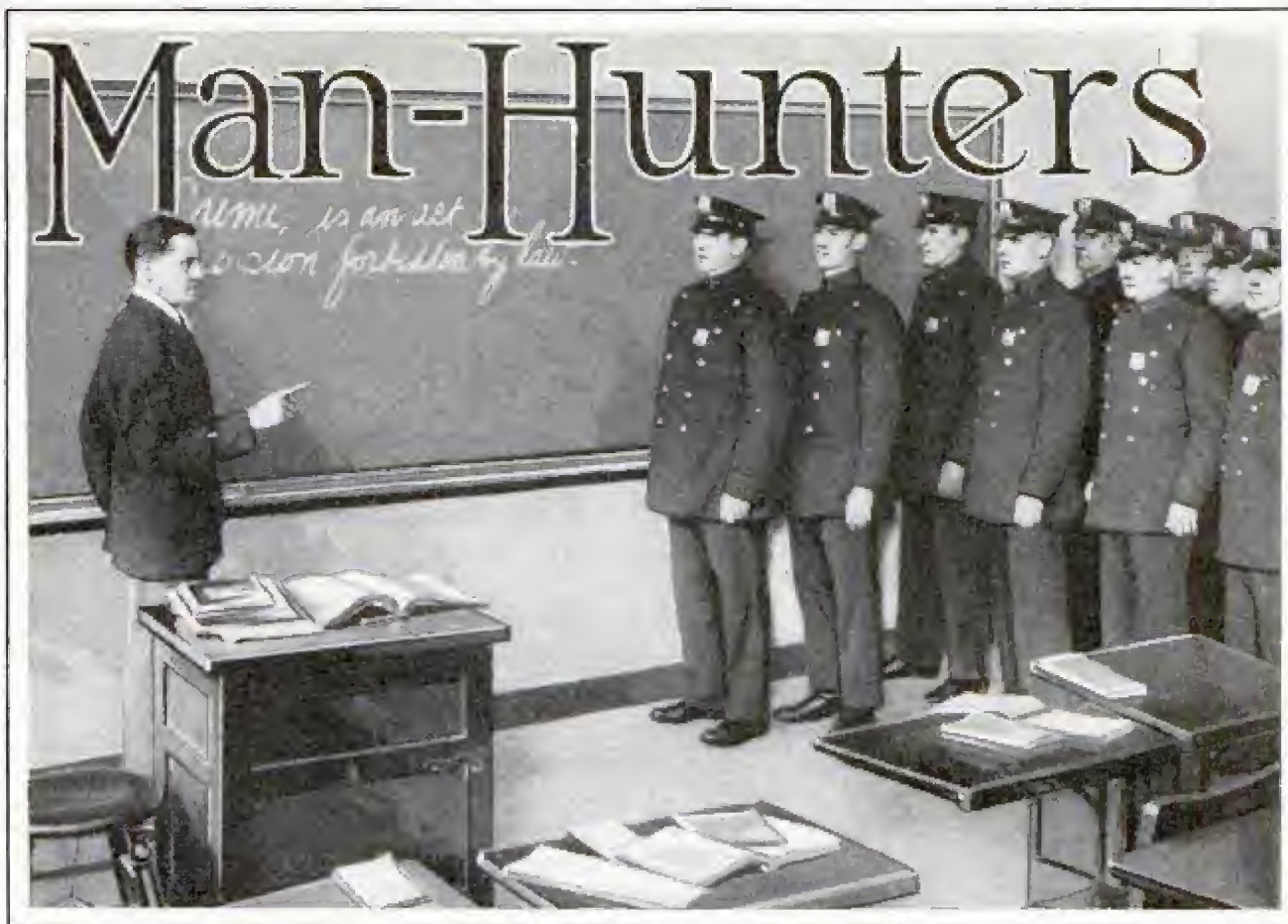
THE BAFFLING mysteries of the future will not be solved by detectives relying on their personal skill, but by exact scientific methods, according to William Souder of the bureau of standards.

A grain of dust, the scratch of a pen, a spent bullet, will tear the mask from the face and hands of a criminal with absolute certainty, Mr. Souder said in discussing ways of identification now being standardized by the government.

As another step in modernizing crime-detection methods, the University of Chicago has created a special department to study means of detection and prevention under the leadership of August Vollmer, former police chief of Berkeley, Calif. Not long ago, Detroit officials, recognizing the



Patrolman Lawrence Spitzer Using an Automatic Rifle Which Fires 400 Shots per Minute



Rookies of the New York Police Department Receiving Classroom Instruction in Some of the Fundamentals of Their Work; Theory and Practice in Police Operations, as Elsewhere, Make a Good Combination

Speaking of the telltale marks left by typewriters, Mr. Souder said recently: "Attempts to destroy these beacon lights of evidence are seldom successful and would require, on the part of the one who seeks to mask them, a perfect analysis of every defect with equipment not readily available. Experts who make identifications in a logical, precise manner, will replace the detective who recognizes no limitations, no standards and no equipment as essential to his field. The cunning criminal who masks his face and gloves his hands, will find himself pitted against the cold scrutiny of microscopes that will tear his identity from a typewritten document, a pistol ball, a cartridge shell or a signature. Radio, now being adopted by several police departments to speed crime squads to the scene, will be another aid to the scientific detective, it is pointed out, when special squads, equipped with cameras, fingerprint apparatus and other tools, can hurry to the place of a crime in response to the call of the wireless and gather evidence before it becomes obscured.

One of the largest "academies" for the

training of policemen is in New York City. It was established in 1925 by Richard E. Enright, former police commissioner, and already has trained thousands of men for the special duties of the force. It is a branch of the City College of New York, and entrance is based on a civil-service examination, special tests covering a wide range of subjects, and, of course, a rigid physical examination.

Having passed the preliminary trials, the candidate is at once appointed a probationary patrolman, which rating he holds for six months, while he draws a salary equivalent to \$1,769 a year. With entrance to the ranks of the probationer, the real training begins.

For the first three months, the man is sent through a severe course in classroom and gymnasium work. He is instructed under police lieutenants who have specially qualified for the task, in discipline, deportment, government and civics. Then he is given a course in crime, involving a minute analysis in all its phases. With this instruction he gains familiarity not only with some of the scientific methods of investigating crimes but also comes to



know the ways of the criminal. The rest of the course takes him through lectures on the city ordinances, on court procedure, etc., and finishes with treatment of criminals from the moment they are arrested to the point where they are convicted or acquitted. So thorough is this branch of the training that, when he is assigned to his beat, he knows more about the job of a policeman than did the police captain of twenty years ago.

Dealing with criminals is not all that the student concentrates upon. He is drilled in conduct at fires, in accidents, patrol duty in general and in the duties of a traffic officer. During the final part of the course, he is taught co-operation with the federal government in curbing violations of its statutes.

Singular as it may seem, the New York policeman in the making is taught this fundamental principle: "It should be impressed upon the recruits throughout the academy work that warning and admonition will usually be found more efficient in the correction of many violations of the

ordinances than the serving of summonses or the making of arrests."

In the physical-training course, the recruit goes through severe taxation of his energies. Of the seven-hour academic day, four are spent in the physical-development department. It is the aim of his superiors to mold his body to perfection, capable of coping with any physical emergencies.

He is given military drill at first, followed by setting-up exercises. Next comes jujitsu work of which he is given an abundance. The same goes for boxing. For those who are not good swimmers, there is a special course. With

these forms of activities as starters, the recruit is launched on a heavy exercise schedule.

The aspiring rookies, ranging from the late teens to the early twenties in age, are given an expert course in the use of firearms. The object is to so train them that they will be able to use their revolvers under all circumstances; at night, when it is impossi-



Learning to Fire a Revolver; Teaching by the Use of Pictures, and Practice with Acetylene Torch



Police Rookies Learning Effective Holds to Be Used in Overpowering Crooks; 3,000 Police of New York Taking Civil-Service Examinations, and Crack Shots of the Los Angeles Police Department in Training for the National Marksmanship Competition; Practice on Ranges of Varying Distances, and with Moving and "Trick" Targets of Many Kinds, Gives the Police Valuable Experience in Learning to Fire under Battle Conditions When They Meet the Criminal



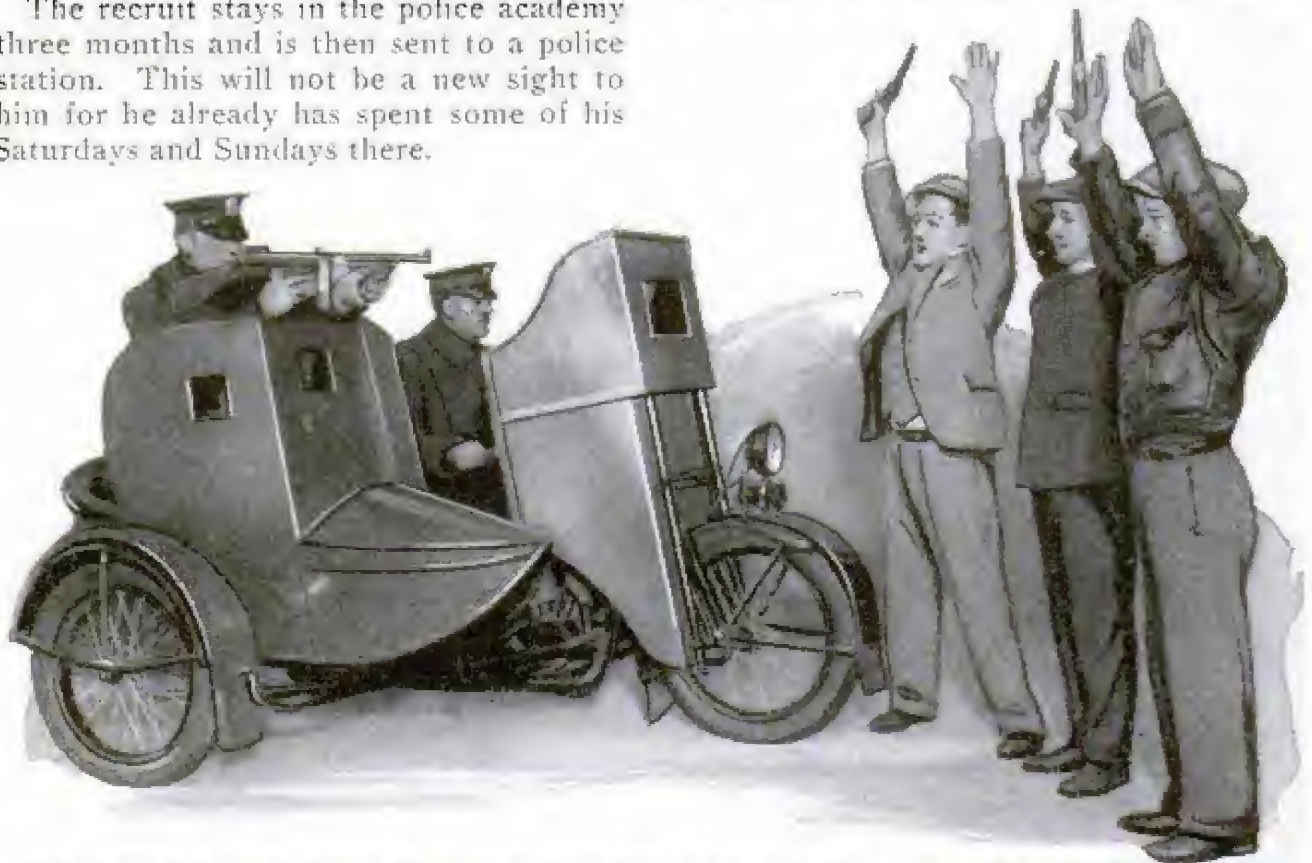


Chemicals Effective in War Have Been Adapted with Success to Police Needs; Here, Members of the Philadelphia Department Are Testing a Cannon That Spreads a Barrage of Tear Gas

ble to sight the piece in aiming, as well as in the daytime.

The recruit stays in the police academy three months and is then sent to a police station. This will not be a new sight to him for he already has spent some of his Saturdays and Sundays there.

In the next three months of the course, he goes through the gamut of the patrol-



High-Powered Armored Sidecar Motorcycles Have Been Tested with Success as a Safe and Efficient Vehicle for Attacking Crook Gangs; the Units Are Literally Three-Wheeled Forts

man's duties. He covers a beat in the company of another policeman. He does traffic duty under the supervision of an experienced officer. Then he gets court duty, lectures and special instruction in first aid and personal hygiene. When his six months' course is up, he is made a regular patrolman. To achieve this goal, however, he must make an expenditure of \$250 to cover his outfit from head to foot. It has not cost him a cent in tuition to attend the police academy, but when he is done, he must purchase his own uniforms. The only thing which the city gives him free is his policeman's shield with his number on it.

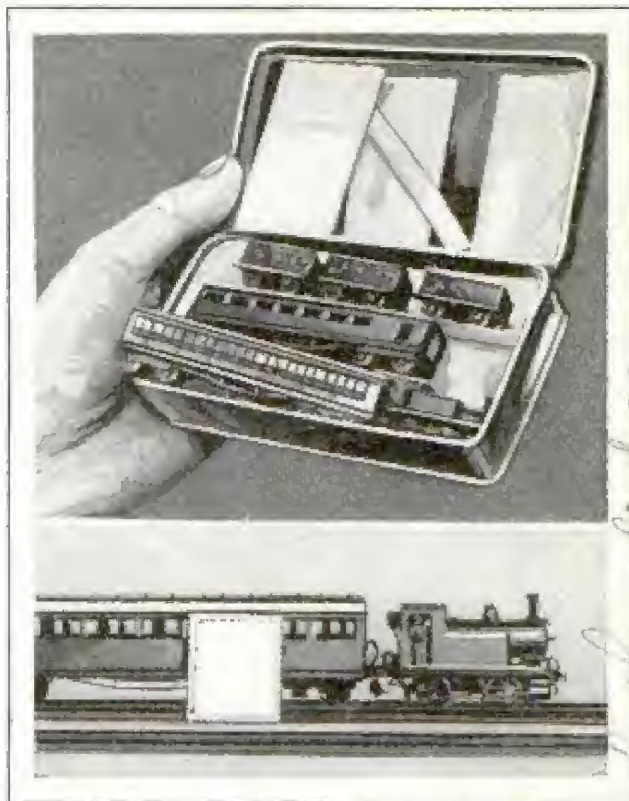
Now, he sets forth on his career. He is raised to a salary of \$2,500 a year. If he remains in the ordinary patrolman class, and does not choose to rise above that station, he will get \$2,500 a year until the day he is eligible for retirement, which is at the end of twenty-five years of service. Then he is pensioned at half pay. If he is injured in line of duty, he is given full pay.

As a policeman, he may meet a multitude of opportunities. Distinction in service may win instant promotion for him. Even if he should not distinguish himself by any notable feat, a reasonably good standing may make him cited and advanced to plain-clothes duty, and his salary will leap ahead as he advances in his work as a detective.

There are examinations from time to time to fill openings in the ranks of sergeants. The same goes for lieutenants and captains later. So also for inspectorships. Yet, there is no telling when, as a policeman or detective, he might accomplish some heroic deed and be promoted by the police commissioner's command.

Of the 265 rookies who were admitted to the academy last spring, a survey showed that one-third had been mechanics, one-third chauffeurs and the remaining third came from various walks of life. Out-of-town police officials often sign up for courses. At one time, women were trained for police duty, but the courses were abandoned three years ago. Prison keepers are given a month's special course.

☐An ant can pull 1,400 times its own weight.



Tiny Model Train Packed in Small Box, and Compared with Postage Stamp to Show Its Size

TRAIN OF POSTAGE-STAMP SIZE SHOWS MODELER'S SKILL

One of the smallest working models of a railway was exhibited in London recently. It is only an inch high at the tallest part and runs on a track three-fourths of an inch wide. The scale is two millimeters to the foot. The train is run by a small electric motor which is concealed in the engine.

CHARCOAL BROILER FOR PICNIC IS EASILY CARRIED

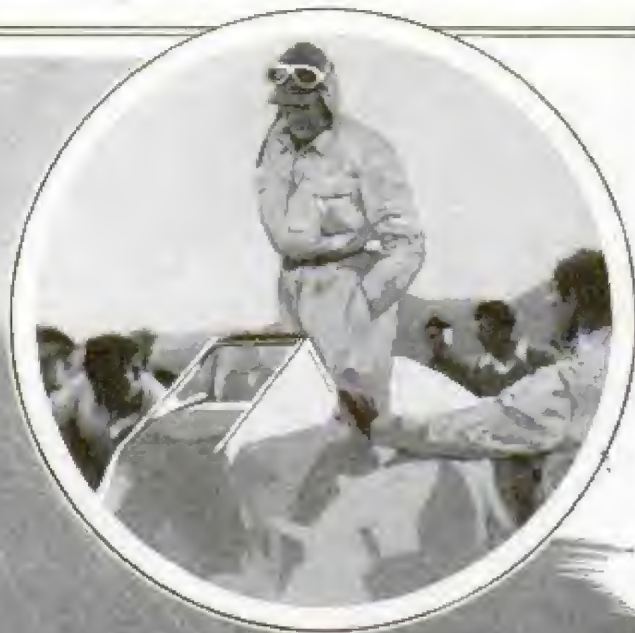
A portable charcoal broiler with its heating surface along two sides in a vertical, instead of horizontal, position enables the hurried camper to broil both sides of meat at once in a holder slipped between the two heating surfaces. Coffee or vegetables may be cooked on a metal surface on top of the stove. It may be packed compactly for carrying in the automobile and burns charcoal briquettes ranged along the two sides.



Elbert Co. 725 Grand Ave. St. Louis, Mo.

Made by J. L. Landridge, Model Railway Club, London, England.
 2865
 2885
 507 W. 10th St. St. Louis, Mo.
 Bo So Specialty Co., Inc.

2989 *Cape Town, South Africa*
FUTURE SPEEDWAY SEEN IN BED OF DRIED-UP LAKE



© Mythe Clayton

Lake Bottom in African Desert Hailed as the World's Future Speedway; Inserts, Captain Campbell and Racer Which Made 224 Miles an Hour on the Course

In the midst of a South African desert lies a sun-baked expanse of mud hailed by those who have seen it as the world's super-speedway of the future. Predictions that cars eventually may travel over this dried-up lake bed at 260 miles an hour were made after Capt. Malcolm Campbell, British driver, made a 6,000-mile trip there to test his "Bluebird" racing auto at 224 miles an hour, second only to that made by Maj. Henry Segrave at Daytona Beach of 231 miles an hour. Captain Campbell said that beach tracks, because of the hazards of shifting sands and high winds, can no longer be used for the records to be made in the future. "This desert track is

unique," he declared. "With some expenditure, it could be made so wonderful that all the world's records in the future would be made on it." The lake bed, seventeen miles long and eleven miles wide, is known as Verneuk Pan, deriving its name from the Dutch "verneuk," meaning "cheat," bestowed because of its mirages. Preparation of the track for Campbell's attempt cost about \$20,000, most of the money being spent in treating the surface, which consists of a six-inch layer of baked mud, creviced minutely, on a solid shale foundation. The cracks were filled with

Alarm, due
POPULAR MECHANICS *Rochester, NY 425*
Seattle Wash Aug 30/27 872 Hudson

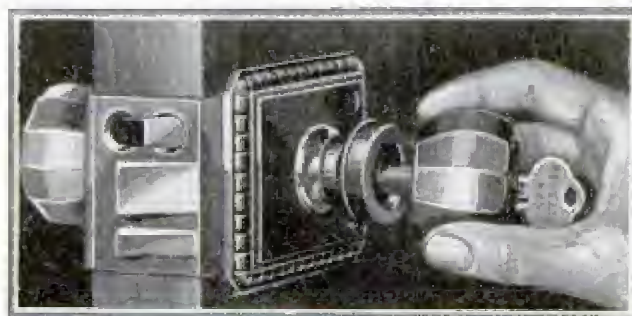
liquid mud, making the track as smooth as a billiard table, and crude oil was sprayed over a section of it, binding it like asphalt and forming a glasslike, non-skidding surface that racers said would stand speeds of 260 miles an hour or more. Its one great handicap is that it lies in a desert country, 100 miles from the nearest railroad and forty miles from any village, but it is maintained that it offers the best substitute for the nearer beach tracks.

**RADIO BURGLAR-ALARM SYSTEM
 ANOTHER BLOW AT CRIME**

Proposing to establish a radio burglar-alarm system, a Seattle, Wash., corporation has applied to the federal radio commission for a wavelength of 109 meters for such a purpose. The radio already is employed in some cities to notify detective-bureau squads of commission of a crime. In Seattle, it is proposed to hook up a radio-signaling system with electrical wires in homes and business establishments. The transmitter would send out a buzzing tone signal to a central office.

**DETACHABLE KNOBS FOR EASY
 CHANGE OF DOOR LOCKS**

Locks with demountable knobs and interchangeable cylinders are being provided for office buildings and other semi-public places, to insure extra protection for tenants' valuables, particularly in their absence. These locks are of the key-in-the-knob type and operate as any other similar lock until it is desired to change the cylinder. A release key is then used to detach the knob, after which the cylinder may be changed and the knob replaced or a new knob with different cylinder inserted. The change may be made quickly without removing the lock from the door and is useful when changes of tenants occur, in which case the keying of a single lock or group of locks may be changed. Master keys operate all individual locks for a building so equipped.



This Demountable Door Knob Contains a Detachable Cylinder Which Simplifies Changing Locks



Sixteen Lenses Are Combined in One in This Camera to Give Depth to Portrait Photos

**DEPTH IS GIVEN TO PHOTOS
 BY COMBINED LENSES**

Sixteen lenses have been combined into one to provide the eye for a portrait camera and give depth and naturalness to a photograph. This enables the grouping of persons as artists do instead of keeping them all on the same plane at equal distance from the camera. The multifocal lens gives speed and yet makes all objects in the picture appear clearly and free of distortion. Lenses of long, medium and short focus were combined by grinding them into many different zones to eliminate blurred backgrounds and shadows. Universal-focus lenses have been used in small cameras, but heretofore have not been applied to portrait cameras.

**WOOD IN TUBE-PASTE FORM
 SIMPLIFIES REPAIRS**

A wood composition material, applied from a tube like glue, has been introduced for repairing furniture, filling cracks and for fixing various articles. It is easily squeezed out, and the tube reduces waste and keeps the substance in good condition. It has no grain and hardens upon exposure.

Chicago-160 h Well
Chicago-150 Wachter Service

\$175.00 to \$245.00

*Wood Fin Product Co
 40 Canal St. Boston, Mass*

Argent & Co. New Haven Conn.

2982

The

Inventor's



glory of American invention.

"Their names are not flaunted in print, nor do they issue accounts of their researches. Because they're too busy now, chopping wood, planting corn, washing windows and shining shoes.

"The belief is widespread," he continued, "that the old-fashioned ways of invention are gone—replaced by research laboratories owned by corporations. I don't think so. Of course, we can't belittle the excellent work done by scientifically trained men. Captains of industry comb the world for talent, but seldom they produce basic inventions."

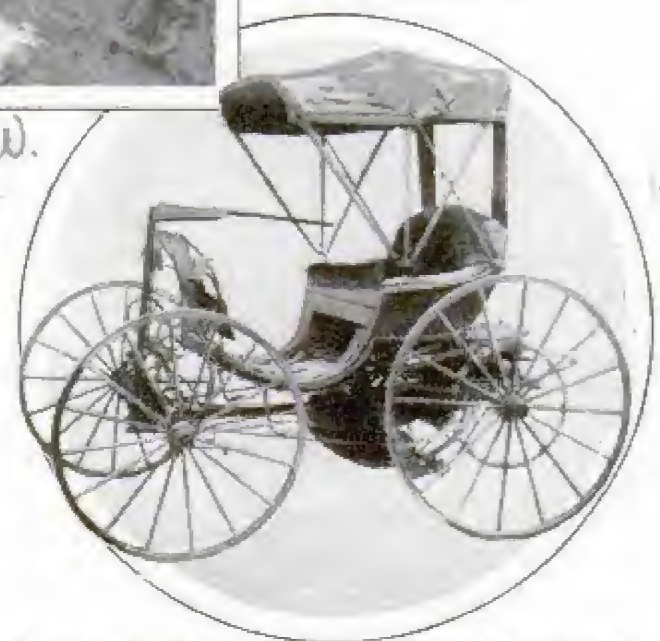
By **DON GLASSMAN** 545 W. 11th St. New York

IF WALLS had tongues, the corridors, basements and galleries of the patent office would have reason to shout.

American inventors are jamming the classic stone structure in Washington at such speed that the patent commissioners are alarmed.

A lightning filing system has been devised. Necessity forced it. Enjoined by law to preserve copies of printed records, the custodians of the nation's patents evolved a housing plan for 1,800,000 inventions. There are now 120 miles of shelves. Approximately 1,000 patents are issued weekly, while twice as many are rejected.

Dr. William A. Kinnan, first assistant commissioner, was asked about his best customers. He replied emphatically that "free lances" still are the mainstay and



Upper Left, "The Genius of Invention," a Mural in the Patent Office Library, and, Below, Duryea Gasoline Automobile of 1893

"Is this a scientific age?" another official asked. "Perhaps. But look into the history of American invention and you find that basic, revolutionary devices were con-

Hall of Fame



The License Plate Reads 1921, but the Car Obviously Is of a Much Earlier Vintage; Autos Such as This Were Considered the Last Word in the Early Motoring World

ceived by men who knew nothing about science—mad men and ‘fools,’ unlearned in scientific theory and ignorant of laboratory practice.”

In connection with the history of creative talent, an interesting piece of speculation is the first invention. Lincoln said, “Man’s first discovery was his nakedness. His first invention was the fig-leaf apron, which seems to have been the origin of clothing.” Another man holds that the alphabet was the first invention. Someone else claims a club as a weapon. Another says fire-making apparatus, and so on. Perhaps Lincoln summed the topic best, saying:

“All creation is a mine and every man a miner.

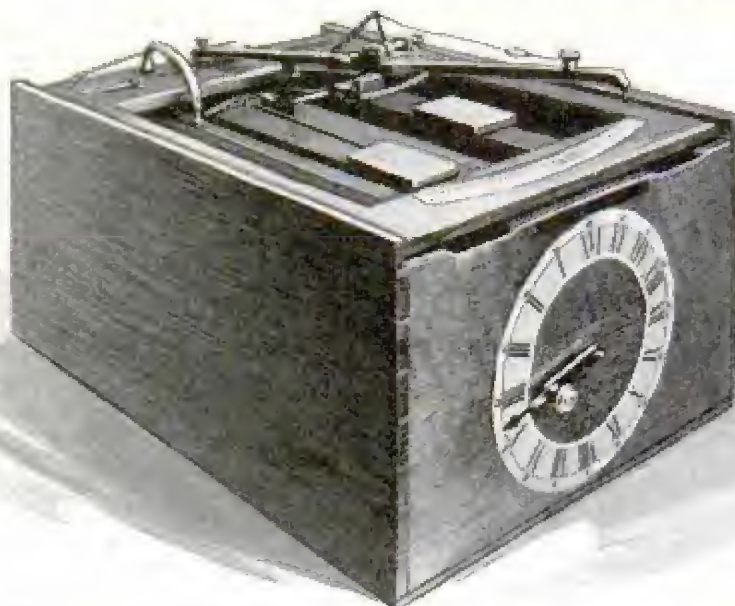
“In the beginning the mine was unopened, and the miner stood naked and knowledgeable upon it.

“Fishes, birds, beasts and creeping things are not miners, but feeders and lodgers merely. Beavers build houses, but they build them in no wise different or better than they did 5,000 years ago.”

Believe it or not, an investigation of why poor individuals take to inventing reveals that, in most cases, financial reward is the least consideration. Edison needs no money. Mark Twain invented a scrapbook, because there was no better way of filing news clippings about him. A Florida woman was asked why she invented a device for distributing fertilizer and answered:

“Laziness, I guess. I’m tired of bending my back the old way.” Can a woman invent and be lazy also? At any rate, one-fifth of all the patents granted are issued to women.

Pass down the shelves of fame—simple pamphlets illustrated by pen drawings. Some the world has never heard of; others have built giant industries and written deathless names. The age of mechanics rests on a foundation of seventy pillars, to wit: In agriculture, Whitney’s cotton gin and McCormick’s reaper; in transportation, the Wright brothers’ airplane and the Westinghouse air brake; in telephony, Bell’s telephone and Berliner’s



Courtesy of the National Museum

The Forerunner of the Modern Typewriter; It Was Called a Typographer and Was Invented by William A. Burt

transmitter; in warfare, Colt's revolver and Holland's submarine; in phonography, Edison's talking machine and Berliner's lateral disk record; in moving pictures, Edison's kinetoscope and Jenkins' projector, and so on.

Think of electricity. Mysterious force. Ben Franklin enchanted a bolt of lightning and caused its descent from heaven. He should have been killed, theoretically. But he survived to tell how he had married sparks generated by man in a laboratory to electric bolts shot by lightning.

Edison, the news "butch," had the luxury of a traveling laboratory. Bottles, test tubes, chemicals and filters were lined on shelves of a train's baggage car. One day the engine shrieked to a sudden halt and upset the laboratory. Phosphorus set fire to the baggage car. The conductor arrived in time to smother the blaze. He gave the youngster a severe cuff on the ear as he booted him off the train.

Next we find him waiting for a new train at a railroad station. The station agent's son is playing on the track. A train approaches. Edison averts the boy's death, and is rewarded with free instruction in the secrets of telegraphy. At sixteen, he falls heir to the position of telegraph operator at Port Huron, Mich.

"Tell me why the telegraph works," he asked a line repairer.

"Like this: Suppose you had a dog, a dachshund long enough to reach from London to Edinburgh; if you pull his tail in Edinburgh, he will bark in London."

Today, hundreds of thousands have had experience with electricity, yet no one has improved on the lineman's explanation. An electric current is a gigantic question mark. But look how inventors manhandle question marks!

Edison spent much time learning what people needed. When he was convinced that an electric light would serve practical ends, he said:

"I'll make electrical lanterns so cheap that only rich men can afford

to burn candles."

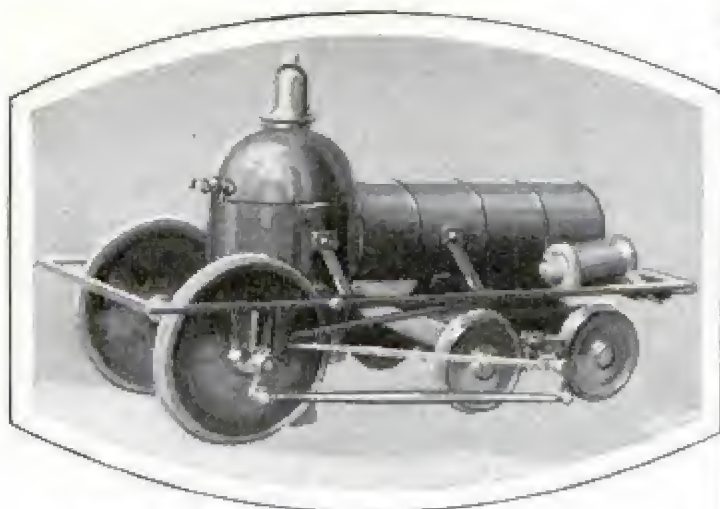
Paper, metal, textiles and carbon compounds—all these were subjected to tests and experiments. He sought a substance to withstand the white glow of luminous electricity. Charred paper in an airless vessel stood up for about eight minutes. A cotton thread glowed behind sealed glass for forty hours, and the cost of the experiment was \$40,000!

One hot afternoon, he picked up a palm-leaf fan and saw it was trimmed with a strip of bamboo. And it made better filaments. He sent bamboo expeditions all over the world. But on completion of the hunt, discarded all imported samples, for he himself had discovered a carbon compound that was superior.

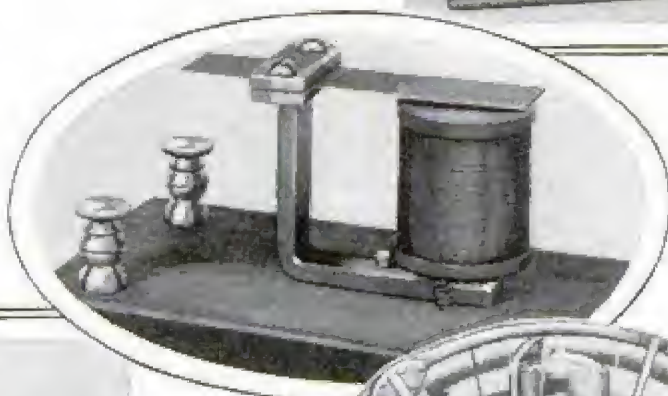
Samuel F. B. Morse, a portrait painter, was returning from Europe in 1832, when he was shown an electric magnet and told of experiments by the Frenchman Ampere. "An electric current passes instantaneously over a wire of any length," it was explained.

"If that is true," responded Morse, "then instantaneous communication is easy." At that moment he was still an artist. For twenty years he had struggled for fame in art. He worked for three years as an artist, seeking to subsidize himself as an inventor. His equipment was so crude that he feared to show it. And his living so stinted, that he smuggled food into his room at night.

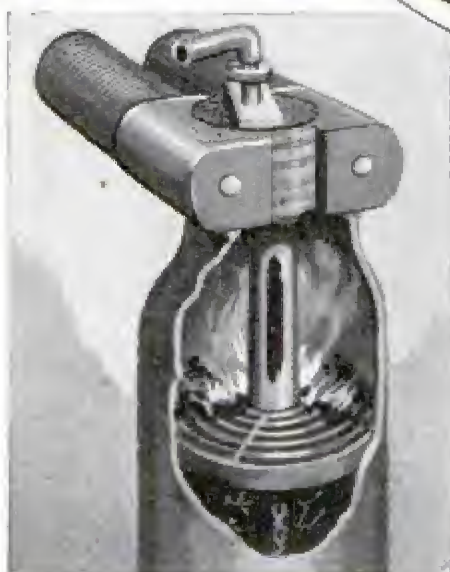
Who symbolized himself better than Morse when he wrote the first telegraphic



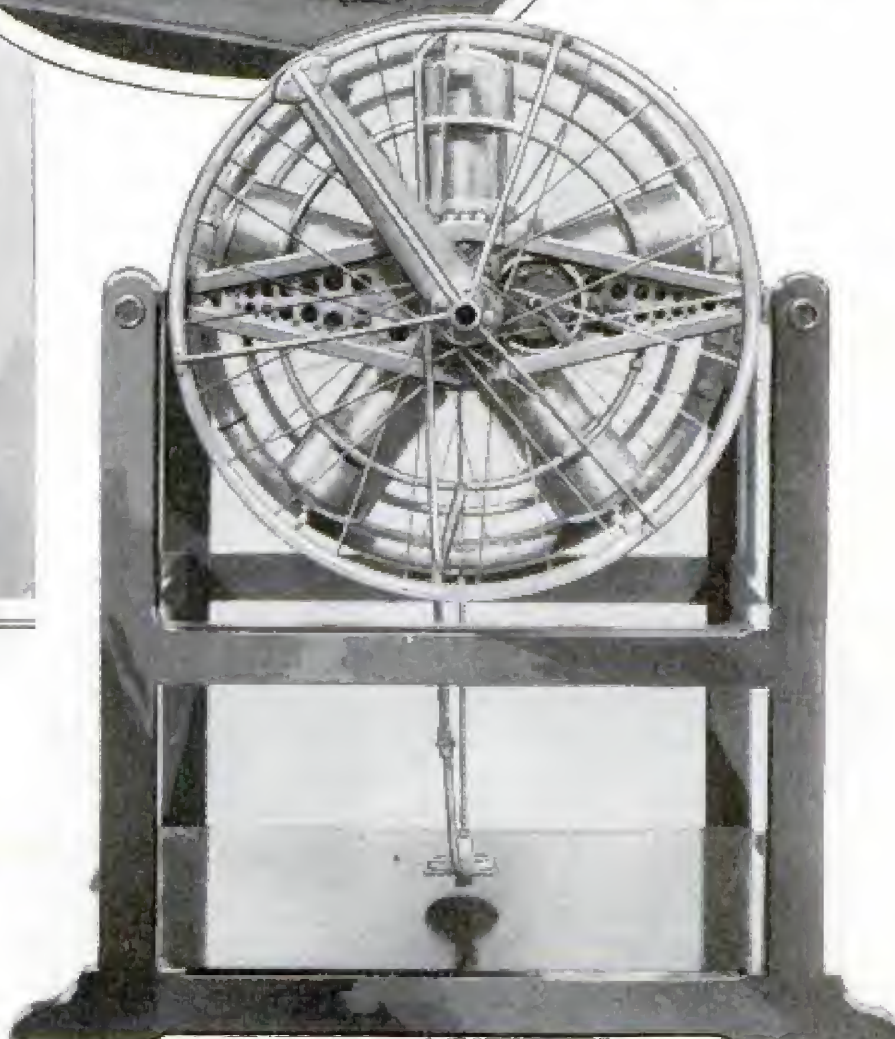
Model of the Baldwin Locomotive of 1840, and, at Right, Center, the Harmonic Reed Used by A. G. Bell in Developing the Telephone; from Such Comparatively Crude Beginnings. Two of Our Most Important Forms of Communication, Railway Transportation and Long-Distance Speech, Have Grown Far Beyond the Expectations of the Inventors



Not Much Like the Voting Machines of Today, but Intended for Somewhat the Same Purpose; the Vote Recorder, Thomas A. Edison's First Invention



Sketch Showing the Interior of Edison's Pyro-Magnetic Motor Heated by Coal, and, at Right, Prof. Charles Manly's Airplane Radial Gas Engine; in 1903, It Was One of the Most Powerful for Its Weight, as It Developed Fifty-Two Horsepower; Today Further Necessity of Streamlining, to Decrease Wind Resistance, Indicates the Substitution of the Radial Motor for the More Slender "In-Line" Type



message: "A patient waiter is no loser." Or gave it a more sublime ending than, "What hath God wrought?" which bounded over a forty-mile circuit from Washington to Baltimore.

Another teacher, Alexander Graham Bell, instructed deaf-mutes.

"If I can make deaf-mutes talk, I can make iron talk," he assured himself.

At first his major interest was a music telegraph, with a number of keys like a piano, capable of sending a like number of different tones over a single wire.

It took months of experimentation to send the simple twang of a watch spring over a wire. That was convincing. All it needed now was refinement. He forgot his early lament about lacking a knowledge of electricity. He taught himself all about it.

Bell exhibited at the Centennial Exposition in Philadelphia. His table stood in the Education building, the last to be visited by a committee of expert judges. When they came, the modest inventor prayed silently for an appraisal of his device. All learned men, they came, saw and began walking away. For that plaything on Mr. Bell's table was a device to interest—well, other "fools" like Mr. Bell.

Dom Pedro, emperor of Brazil, picked up the receiver and shouted electrified words:

"My God! It talks!"

The judges returned and immediately pronounced Bell's telephone to be one of the greatest inventions in the world.

Another epic discovery: Heinrich Hertz,

professor at the University of Bonn, proved that electricity flows in waves—Hertzian waves, spanning oceans, scaling mountains, circumradiating the globe.

Who braved the magic air waves? Not scientists, nor professors absorbed in books, but an adolescent boy, Guglielmo Marconi, Irish-Italian. He shot a feeble voice into air, and listeners yelled, "Louder! louder!"

Came DeForest, the Yankee, and placed a throttle on radio. "If you want louder speech and greater distance, simply add another one of my vacuum tubes." But who thinks of tubes as he talks from San Francisco to London?

The automobile first appeared as a one-lung steam buggy. William Murdock ran it around Piccadilly Circus in 1784 and caused a panic in London.

But twenty years earlier, a French army captain sought to move heavy cannon. He mounted a steam engine on a three-wheeled tractor. His hopes collapsed when his machine was wrecked by running against a stone wall.

When oil began to gush from a hole in the ground at Titusville, Pa., the auto buggy found its real ally. The Stanley brothers began making a steam automobile, and Amzi Barber founded the Locomobile company. Haynes drove his gas buggy in Chicago and was ordered off the street by an irate policeman.

And so the patent-office files grow at the rate of about two miles a year—a glowing record of the Golden Age of Mechanics.



How the Boys of Oakland, Calif., Used to Spend Their Sundays and Holidays Not Many Years Ago; This Collection of Old-Time Bicycles Is Now in the Possession of Josiah W. Stanford



These Dolls Are Used by the Bureau of Mines to Demonstrate the Various Accidents That Befell Mine Workers and the First-Aid Treatment for Each Injury

UNCLE SAM'S DOLLS TEACH FIRST-AID METHODS

Dolls are used by the bureau of mines to demonstrate work in first aid to miners. For each injury likely to occur in a mine, there is a doll victim of a similar accident, with a bandage or other appropriate treatment in place. The crippled-doll display is intended to be useful in the moments immediately after an accident before medical help arrives. The dolls show the various kinds of accidents that befall mine workers, as well as the method of treatment, and also are intended to serve as a safety warning.

TOY TRAIN OPERATED BY VOICE BROADCAST OVER RADIO

Controlled by a human voice broadcast over the radio from New York, a toy electric train in Pittsburgh obeyed verbal commands of the operator in a recent demonstration. The words controlling the train were carried by telephone from New York to Pittsburgh and then broadcast, being picked up on a regular radio receiver in front of which was an ordinary telephone connected by wire to the train. The train, called "Casey Jones," is dependent for operation on voice im-

pulses received by the telephone transmitter. A command is carried through a radio detector tube to a special selector determining the polarity of the track upon which depends the direction in which the train moves. Two syllables, such as "go ahead," operate relay and selector to provide forward movement. An order in three or more syllables, such as "back up, Casey," sends the engine backward, and a single syllable, "stop," causes a halt.

HEDGE RESEMBLING BIG PIANO TOOK TEN YEARS TO GROW

After ten years of clever effort with a pair of clippers, a gardener of Bridgeport, Conn., has produced a hedge designed along the lines of a giant piano and now boasts being the only man to grow one. The hedge piano is twenty feet long, nearly six feet high, and standing beside it are a piano bench, lamp and chair.



This Piano Took Ten Years to Grow; It Is Designed from Hedge, and Is Twenty Feet Long and Six Feet High

News Bureau
General Electric Co., Inc.

Letter returned
8/26/29

Frank Zeto



Serving without Pay, the Man with the Beard Makes an Inexpensive Footman; It Is a Dummy in Livery

DUMMY SERVES AS A FOOTMAN AND SAVES OWNER CASH

Transporting a dummy dressed like a footman about the streets in a limousine may add to appearances even if it does not aid in opening auto doors, and the figure is certainly less expensive. A stage and screen star adopted the idea when her French footman returned to Paris. She ordered a dummy with the facial expression of her absent employe, put the footman's uniform on it and now the dummy accompanies her to any formal functions.

MAGNETS TO LIFT SUNKEN SHIP AND RECOVER TREASURE

Dynamite and powerful magnets are the implements being used to salvage a sunken ocean liner whose treasure room contains gold and silver valued at more than \$5,000,000. The ship is the "Egypt," which sank in 360 feet of water in the Bay of Biscay in 1922 with a loss of eighty-seven lives. In its hold is the bullion, which was consigned to the Egyptian treasury. Two Italian tugs bearing Genoese divers, renowned for their physical endurance, are attempting the salvage operation, the divers using 20,000-candlepower electric lamps to light up the ocean bed in their work. The wreck is first to be dynamited to release the section containing the treasure room, after which the magnets will be brought into play in efforts to raise the various parts of the shattered vessel. If the attempt is a success, efforts will be

made to raise the Belgian liner "Elizabethville," sunk in 240 feet of water off the French coast with 13,000 carats of diamonds aboard.

NITROGLYCERINE IS USED AS LUBRICANT

Using nitroglycerine to grease the squeaky wheels of a cart or to oil boots may sound like madness, but it has actually been done without fatal results. It is related that in Germany nitroglycerine often is carried in zinc cans. The explosive, not entirely free of acids, sometimes ate through the cans and trickled over the cart wheels and in one instance was used as lubricating oil. In another case a bottle of explosive was accidentally broken by an experimenter who later found that his old woodcutter had used what was left to grease his boots.

CUSTOMERS MAKE OWN CHANGE IN BUYING NEWSPAPERS

Several hundred Los Angeles newsboys are so firmly convinced that the average person is honest that they leave money changers and stacks of papers at the curb, inviting customers to help themselves. Buyers deposit their coins in the changer and make their own change. The boys say their losses are negligible.



Patron Buying Paper and Making His Own Change in Los Angeles, Where Newsboys Trust Customers

Mary Duncan

2992

3050

Daily Mail
see Nov. 1930. for 6/3/29

PUSHER PLANE GIVES BETTER VIEW OF GROUND

Test flights with a pusher monoplane have been conducted in England and with satisfactory results, according to reports. In this type of airplane, the motor is be-



Two Views of the Pusher Monoplane, Showing the Passenger Compartment Far Forward, Commanding Wide View

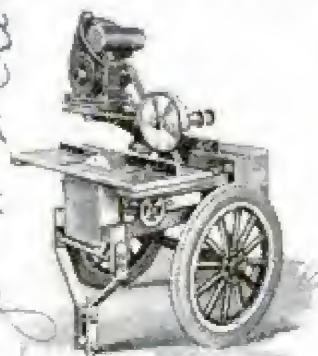
hind the passengers, thereby affording a less restricted view, and there is less annoyance from the fumes from the engine. Greater flying safety has reduced the hazards of the pusher-type plane.

CONGRESS KEPT COOL OR WARM BY AIR CONDITIONING

"Ten degrees cooler inside," the familiar theater sign, now may appropriately be hung on the door of the house of representatives in Washington where a system of air conditioning maintains a constant comfortable temperature for the lawmakers winter and summer. In winter, the temperature is maintained at seventy or seventy-two degrees, and in summer a steady temperature of from seven to ten degrees lower than outside is offered, but because all excess moisture is removed from the air, it actually seems much cooler. At ninety degrees outside, the house reading is eighty or eighty-three, but it appears to be around seventy-three, it being explained that an actual temperature of seventy-three would mean too great a change for persons coming in from outside. The system includes not only circulation of the air and regulation of temperature, but washing it to make it pure, and providing it with the proper amount of moisture.

house chamber and galleries. Similar equipment is contemplated for the senate, and is even being extended to some private homes. Ventilating engineers who worked out the system estimate that 72,000 cubic feet of pure air is forced into the house chamber each minute, and that all the air is renewed each four minutes. In one month of operation, about 500 pounds of dirt was removed from the air, but New York theaters report nearly three times as much removed in one week.

WOODWORKING SET ON WHEELS LATEST BUILDING AID



For crosscutting, mitering, ripping and many other woodworking operations, a portable saw outfit on wheels has been devised. It is run by a single-cylinder air-cooled gasoline engine, is

quickly set up and can be towed behind an automobile as a trailer to the place where work is to be done.

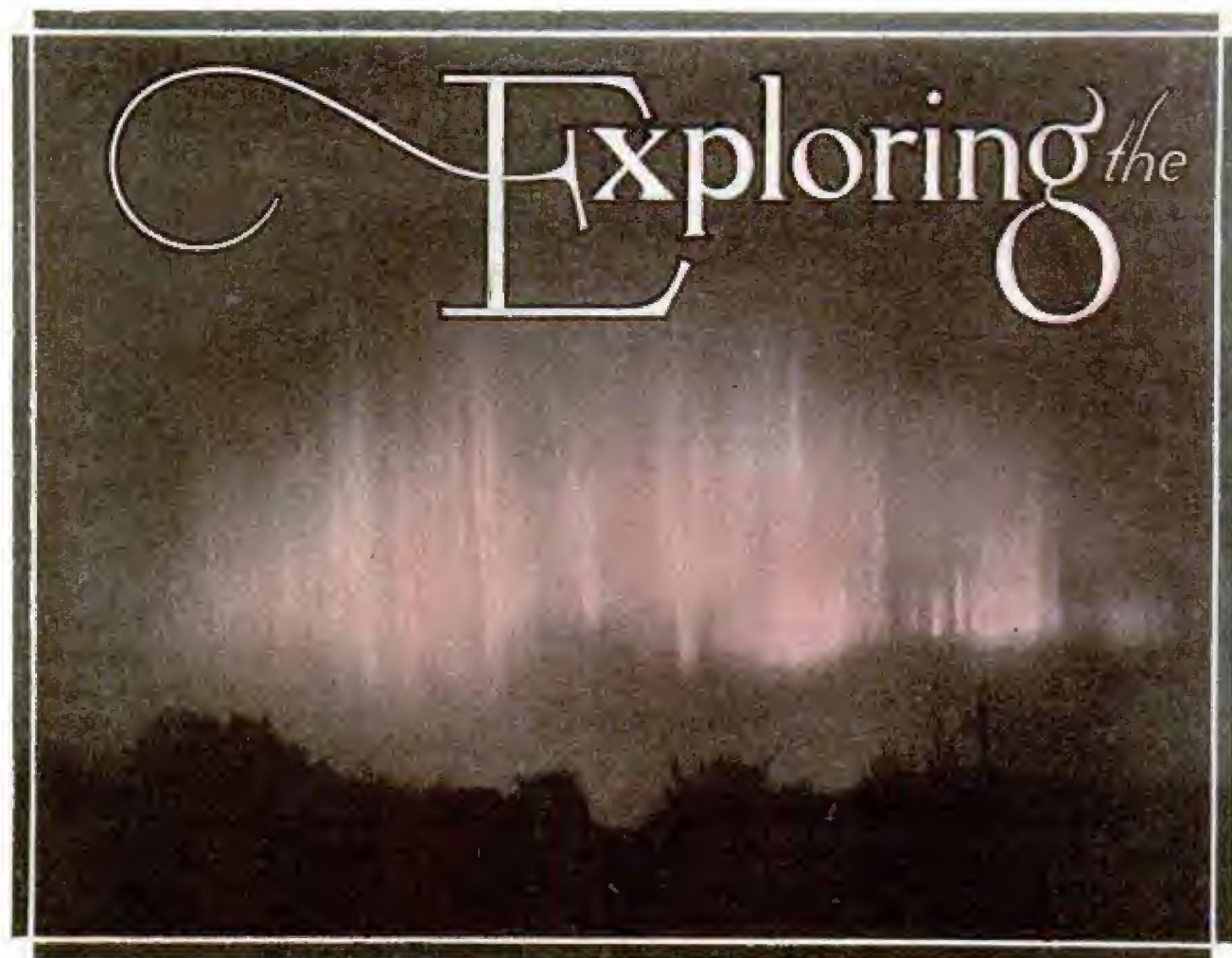
Century plants are relatives of the lily.

Science Service News
Bulletin 4298 6/4/20

Hutchinson 149 G.
Mass. 7. 6/19

no information on motor.

2759



Northern Lights in Their Glory; a Brilliant Display of Auroral Streamers Photographed at Oslo, Norway, by Prof. Carl Stormer

By CALVIN FRAZER

*The Telegram
Co. 1508 40, Washington, D.C.*

ABOUT twenty-five years ago meteorologists embarked with much enthusiasm upon a world-wide campaign of what was—and still is—described as “upper-air research.” It did not relate to the upper part of the atmosphere, but to a region extending a few miles above the earth. Previous to that time, investigations had been devoted mainly, though not entirely, to the bottom of the aerial ocean. The study of conditions somewhat higher up, undertaken with the aid of kites and balloons early in the present century, was felt to mark the beginning of a new era and hopes were entertained that, as a result, weather forecasters would be able to make almost perfect predictions.

Kite and balloon meteorology, otherwise known as “aerology,” is now an old story. Its results have not been quite so revolutionary as was expected, but it has led to at least one epoch-making discovery, and it has proved to be of great value

to forecasters, besides being an indispensable aid to aeronautics. Its methods have undergone no radical change during the last quarter of a century. Kites are still used, though they are less in favor than they were a few years ago. The mainstay of the aerologist is the pilot balloon—a small free balloon that is released and sighted through a theodolite for the purpose of measuring the winds aloft. Throughout the world, hundreds of thousands of these balloons are now sent up every year. Sounding balloons carry up featherweight instruments for measuring barometric pressure, temperature and humidity, but the recovery of their records is usually a very slow process. A promising substitute for both the kite and the sounding balloon, when prompt information is desired about atmospheric conditions other than wind at moderate altitudes, is the aeroplane, equipped with appropriate self-registering instruments.

Stratosphere

There are at present several weather stations in this country and abroad where aviators make daily flights for the purpose of securing such data.

Though it is still customary to speak of sounding the "upper" atmosphere with the various devices above mentioned, the portion of the atmosphere that can be reached by them is really only a small fraction of its total vertical extent. The greatest height ever attained by a kite was six miles; by a sounding balloon, nearly twenty-two miles, and by a pilot balloon (according to a somewhat doubtful record made in Greenland), twenty-four miles. The atmosphere undoubtedly extends many hundreds of miles above such levels; just how far nobody knows. With increase of altitude it becomes greatly rarefied, but there is still enough gas present at higher levels to produce various effects that are not only of scientific interest but also of much practical importance to mankind.

Records obtained with sounding balloons have revealed the remarkable fact that the earth's atmosphere is divided into two distinct layers or shells. The lower, now called the "troposphere," extends from sea level up to a height averaging six or seven miles. This layer enjoys a monopoly of storms, ordinary clouds, rain, snow and most other things usually classed as "weather." Above it lies the "stratosphere," extending to an unknown height. These two shells of the atmosphere differ from each other in several respects. The difference first recognized was one of temperature. When a sounding balloon is sent up from the earth's surface, its thermometer shows a more or less steady fall of temperature until, at the top of the troposphere, it registers some sixty or seventy degrees below zero Fahrenheit. Individual readings vary a good deal, the average for the whole world and for all seasons being about sixty-three degrees below zero. As soon as the stratosphere



Sending Up an "Air-Sounding" Balloon with Automatic Instruments Contained in Suspended Cage; Temperature and Other Conditions Are Recorded at Heights Far above the Range of Airplanes



Diagram of Possible Upper-Air Conditions as Drawn by G. B. M. Dobson, of Oxford University; Note Position of Sounding Balloon

is entered, this steady fall in temperature ceases. Up to the greatest height thus far attained by sounding balloons, there are only small and irregular temperature variations in a vertical direction. Whether this uniformity of temperature continues upward indefinitely is a question concerning which the opinions of meteorologists differ.

The lower part of the stratosphere is supposed to have a system of winds quite unlike that prevailing in the troposphere, but information on this subject is rather meager at present. One more important difference between the two layers of the atmosphere is in proportions of the atmospheric gases they contain. In the troposphere, the winds keep these gases thoroughly mixed, so that their propor-

tions are substantially uniform at all levels. This may also be true in the lower levels of the stratosphere, but higher up, there is probably little or no wind, and under such conditions the gases of the atmosphere would tend to arrange themselves according to their relative weights; the lighter above and the heavier below. Thus the composition of the higher atmosphere is believed to vary with altitude. Its composition at great heights has been a subject of much controversy.

For many years Prof. R. H. Goddard, of Clark University, has been experimenting with a new kind of rocket, which will, it is hoped, carry apparatus for measuring temperatures and pressures, collecting samples of air, etc., up to far greater heights than can be reached by a balloon, and will thus solve some of the mysteries of the stratosphere. Meanwhile, there are several other ways by which this lofty region is being explored.

The duration of twilight, in clear weather, indicates the greatest height at which the atmosphere is dense enough to scatter sunlight. This is found to be about forty-five miles. Occasionally, in summer, curious silvery clouds have been seen shin-

ing through the night in the northern sky. These doubtless reflect the light of the sun and must therefore be at a great height. Certain photographic measurements seem to show that they are about fifty miles above the earth. What these clouds are made of is uncertain, but the most probable guess is that they consist of volcanic dust. It is well known that great explosive eruptions of volcanoes, such as that of Krakatoa in 1883, carry enormous quantities of dust to great height in the atmosphere, where, as there is no rain to wash it down, it remains suspended for long periods.

Meteors, or shooting stars, are visible up to a height of about 100 miles, and beams of the aurora have been seen to extend to heights exceeding 450 miles.



Prof. Carl Stormer at One of the Observation Stations in Southern Norway; They Are Connected by Phone as Headset Indicates So That Photographs Can Be Taken Simultaneously; Below, Professor Goddard and Rocket He Designed for Exploring the Upper Air

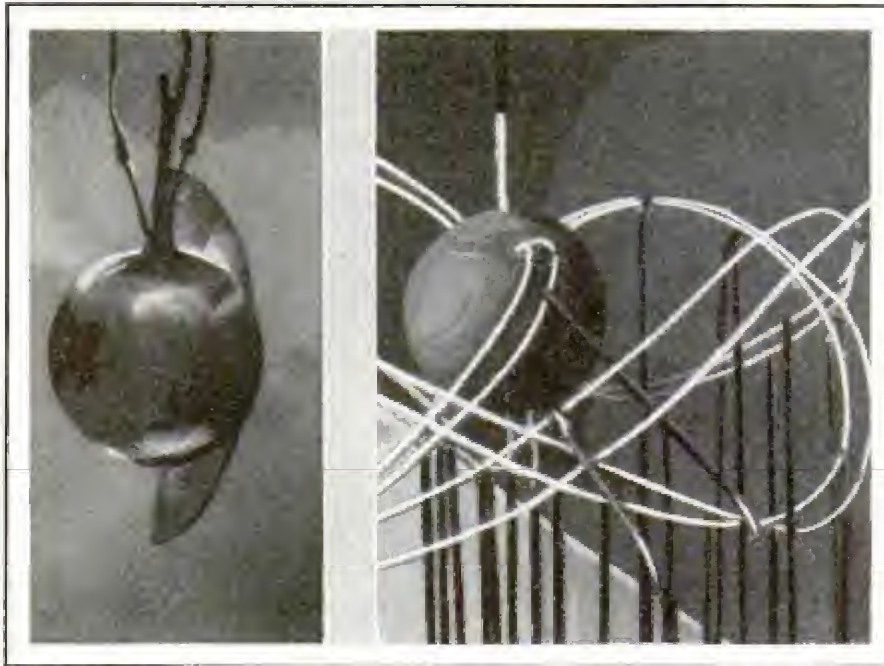
The heights of both meteors and auroras can be measured with considerable accuracy by means of simultaneous photographs taken from two or more places many miles apart. These objects are photographed against a background of stars, and their apparent positions, with reference to the stars in the different pictures, provide a means of calculating their heights as well as their distances from the point of observation.

The photographic measurement of the aurora has been carried on with great success for the past twenty years by Prof. Carl Stormer and his assistants in Norway, and more recently in other northern countries, so that a good deal is now known about the actual location of this phenomenon in space. It forms two rings, which vary greatly in extent from time to time and encircle the magnetic poles of the northern and southern hemisphere, thus giving us the "northern lights" and the "southern lights." Apparently it does not, at any time, extend down to the earth's surface, as was once supposed, but occurs only at heights of from about sixty miles upward.

An auroral display is an electrical discharge in the rarefied gases of the upper



atmosphere, very similar to the discharges seen in the Crookes tubes of the laboratory. It is due to the bombardment of the atmosphere by electrified particles shot out from the sun, and this bombard-



Laboratory Interpretation of the Aurora; Left, Artificial One Produced by Exposing Magnetized Iron Ball to Cathode Rays; Right, a Model

ment, in turn, is especially active at times when there are large sunspots. The earth is a great magnet, and, like other magnets, it has the property of deflecting from a straight path an electrical discharge occurring in its vicinity. This fact explains why the streams of electrified particles from the sun do not cause auroral glows all over the earth, but only in the two belts around the polar regions already mentioned. It also explains how the particles can be twisted so far from a direct course as to cause an aurora on the night side of the earth—the side turned away from the sun.

This whole process is beautifully demonstrated in an experiment in which a magnetized iron sphere, representing the earth, is suspended in a glass vessel nearly exhausted of air and exposed to a discharge of cathode rays. The sphere is coated with a phosphorescent substance, which glows under the discharge in two zones corresponding approximately in position to the auroral belts of the earth.

As the composition of a distant star or of the sun is indicated by its spectrum, one might reasonably expect that the spectrum of the auroral light would reveal the composition of the earth's atmosphere at the levels where the aurora occurs. The auroral spectrum contains some lines due to nitrogen, but its most conspicuous feature is a bright green line, the origin of which has caused an immense amount

of controversy for many years. The last word on this subject is the discovery recently made by McLennan and Shrum, at the University of Toronto, that the line in question can be produced in the laboratory when a discharge is sent through rarefied oxygen; especially when this gas is mixed with certain others, viz., argon, neon or helium. Thus it seems likely, at present, that the atmosphere at the levels where the aurora is visible consists mostly of oxygen. Higher up the lighter gas helium may

predominate, but we have no evidence on this point.

One of the most interesting recent discoveries about the upper atmosphere is that somewhere over our heads (though authorities differ considerably about the height) lies a well-defined layer of ozone—a particular kind of oxygen, which, at one time, figured conspicuously in the advertisements of health resorts and the like, as it was then erroneously supposed to be present in considerable amounts near the earth's surface. This so-called "ozone blanket" in the upper air absorbs a great deal of ultraviolet solar radiation, and prevents an excess of such radiation from reaching the earth. Too much ultraviolet sunlight would be as bad for mankind as too little.

There is another possible effect of the ozone layer that has led to much discussion. In absorbing solar radiation, it must be warmed, and this may lead to a general warming of the atmosphere for a considerable distance upward. Two English authorities believe they have found evidence in the behavior of meteors that the air above a level of about thirty-seven miles, instead of being intensely cold, as it is at the bottom of the stratosphere, is about as warm as on an average summer day at the earth's surface. They think these mild conditions prevail up to a height of about 100 miles, above which level the air again grows cold.

Last, but not least, the stratosphere contains something in which every radio fan is interested—the Heaviside layer. This is a sort of “radio roof,” consisting of electric particles, along which radio signals travel and are eventually reflected back to the earth, thus making long-distance transmission possible. The layer is named for the English physicist, Oliver Heaviside, who suggested its existence as long ago as the year 1902, when Marconi was making his pioneer experiments.

Where is the Heaviside layer? Up to a year or so ago, the authorities seemed to have definitely located it at a height of about thirty miles by day and fifty to sixty miles by night (which would explain why radio signals are heard farthest at night). Recent investigations, however, seem to show that there are two or more of these radio roofs, one above the other, within the atmosphere, and that in some cases radio signals pass outside the atmosphere and are later reflected back to the earth by something out in space—perhaps another planet, perhaps the same stream of electric particles from the sun that causes the aurora.

Meteorology is looking up, these days—much higher up than it did a quarter of a century ago.

FOLDING SQUARE SAVES TIME IN CALCULATING ANGLES



Besides packing neatly into any sort of tool kit, a folding square is designed to save time for carpenters in calculating angles and laying out work. The square is constructed on the principle of a protractor, the arc of which is formed by a circular projection on the tongue. The tongue is snapped automatically into the desired position, and notches allow it to be set at angles representing miter cuts on rafters for roofs with varying pitch.

Ⓢ About half of the soft wood in this country is Douglas fir.



Side View of the Electric Milk Wagon, Showing the Position of the Foot Controls and the “Joystick”

“JOYSTICK” MOTOR MILK WAGON OPERATED FROM SIDEWALK

Designed especially for the milk man's short-stop routes, a motor delivery wagon, guided by a “joystick,” that can be operated from the sidewalk as the driver walks along, has appeared in Los Angeles. There is a stick on either side of the wagon as well as brakes and clutch controls which are on the outside, so that the operator need not enter to run it.

SPARK-PLUG SHIELD PROTECTS WIRING FROM WEATHER

Designed to protect spark plugs and wiring from rain, a shield of aluminum alloy is being manufactured to fit over the plugs and keep them entirely dry. It is attached to the intake manifold and when it is desired to examine or clean the plugs, it is only necessary to loosen two wingnuts, whereupon the shield cover can be swung open.



Industrial Development Co., 292 Monroe St., Chicago, Ill. Messrs. Russell & Jeauroy, 217 W. 1st St., St. Louis, Mo.

June, 1929



Camera Attached to Fire Box Takes Picture of Every Person Turning in an Alarm

CAMERA ON FIRE-ALARM BOX TO PREVENT PRANKS

Experiments are being conducted in New York with a fire-alarm box equipped with a camera to detect the false-alarm joker and performers of other pranks that often lead to accidents and injuries to firemen. The camera, extending on an arm above the alarm box, is set at such an angle that anyone turning in an alarm is within its focus. Sounding the alarm automatically clicks the camera shutter, thus providing a picture of the person that sent the signal.

HOW BADGERS FIND GOLD MINES

Because gold mines in Colorado and Nevada have been discovered after fragments of gold ore were found in badger holes, some miners and prospectors have decided that the animal possesses an instinct causing it to dig where the yellow metal is. Mining engineers and geologists, however, point out that hills frequented by badgers usually have an underlying formation of rock too hard for the badger's claws. While the badger has no nose for ore, it apparently has an instinctive

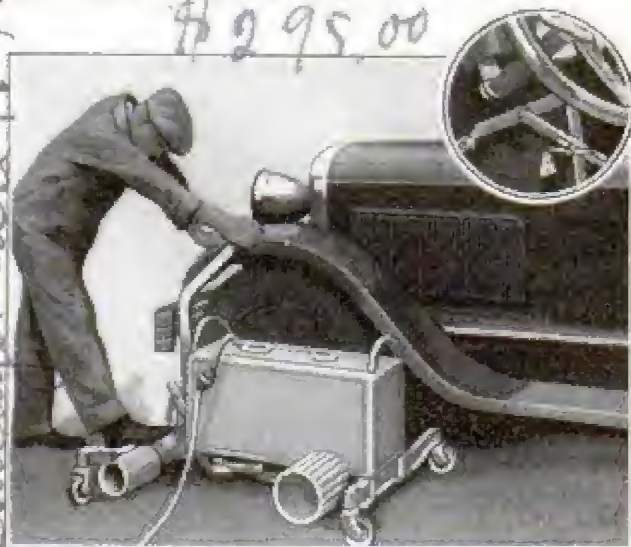
knowledge of rock formations and digs where the burrow will enter a fault or fissure, and so frequently uncovers gold because such breaks in the rock surface are logical places to find ore or veins.

STEEL OF FIRST SKYSCRAPER STILL WELL PRESERVED

Steel beams and iron columns of the old Tacoma building in Chicago, said to be the first skyscraper ever built, were found to be almost as well preserved as when placed in position thirty-one years ago when the building was razed recently to make way for a taller structure. Experts who examined the metal frame said there was no sign of crystallization or rust.

PORTABLE BRAKE TESTER GIVES ACCURATE RESULTS

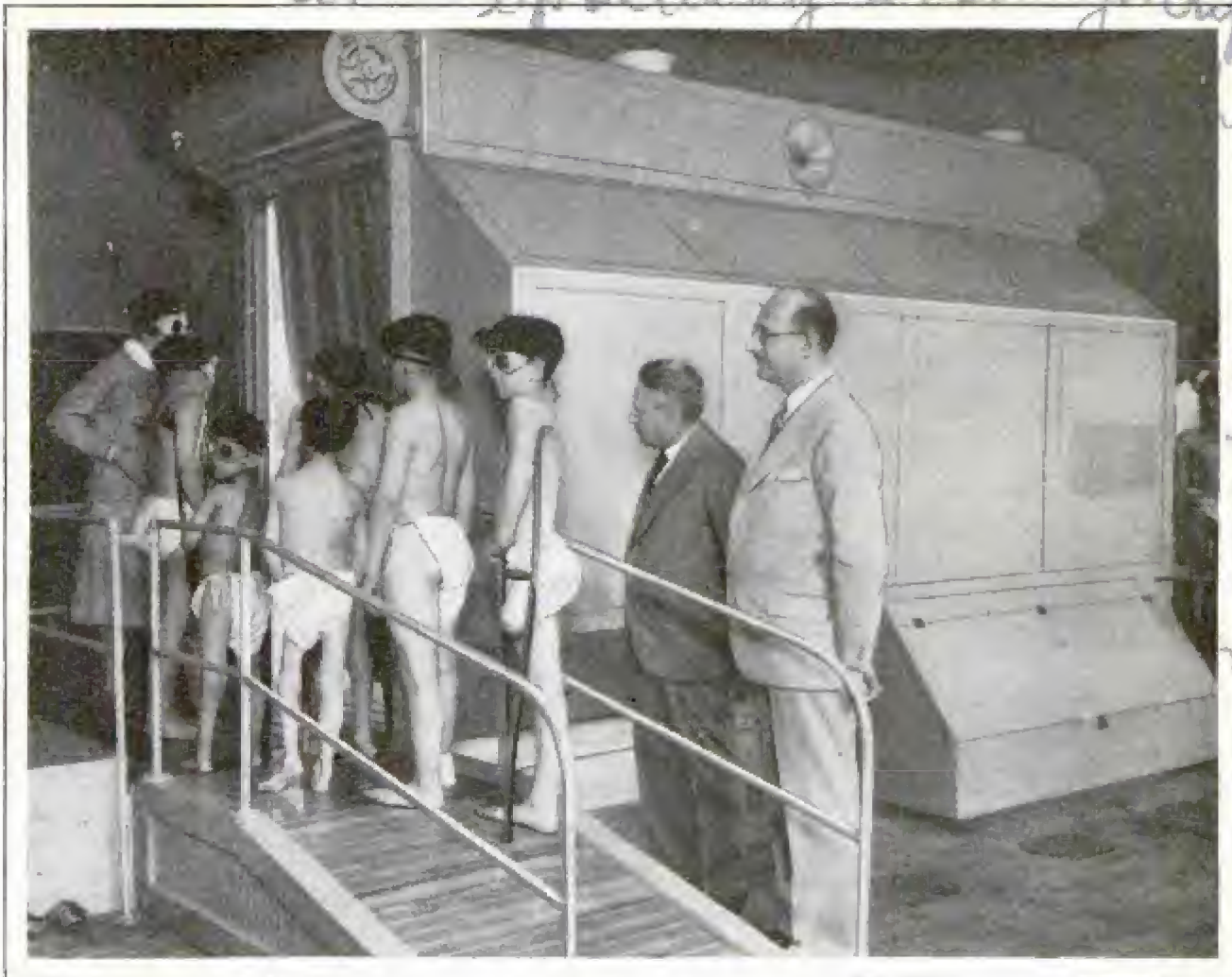
An inexpensive portable brake tester, which indicates out-of-true drums, brake drag or other trouble, has been put on the market. The tester consists of two connected rollers which are shoved under one wheel at a time, after the brake has been set with a pedal. A hand lever brings the rollers in contact with the wheel and at the same time raises the wheel clear of the floor. A worm gear between the rollers is operated when a switch is turned, and the end thrust of the gear, caused by the pull against brake resistance, is transmitted to a gauge. All brakes are set simultaneously by one operation of the brake pedal, eliminating a chance for difference between wheels.



This Machine Finds Defective Brakes; Insert, Brake Pedal Which Maintains Uniform Pressure

Carl & H. Richardson
Tomblick Nevada

Chicago. Carl H. Richardson
Tomblick Nevada



Crippled Children of Chicago Entering Sun Bath, Where a Giant Lamp Administers Synthetic Sunshine to 150 of Them Every Hour; Goggles Protect Their Eyes from the Glare

GIANT LAMP MAKES SUNSHINE FOR CRIPPLED CHILDREN

Synthetic sunshine is provided for crippled children of Chicago by a giant mercury-quartz lamp that administers treatments at the rate of 150 an hour and will cause sunburn within a minute. An automatic moving platform carries the children through the sun compartment, where the lights are so arranged that they reach every part of the body. Each little patient wears a minimum of clothing for the daily bath and is provided with colored goggles to protect his eyes from the glare.

ROADS MADE OF COTTON

Cotton cloth covered with tar has proved a durable surface for dirt roads in experiments in South Carolina. The road is graded, leveled and smoothed, a coarse cotton cloth spread over it, and a thick coat of paving tar applied. The cloth

and tar keep the dirt road from becoming muddy and washing away in rainy weather, and even though the surface cracks, the tar fills up the fissures when the sun warms it. These cloth roads cost about \$3,000 to \$3,600 a mile, only a fraction of the cost of paving.

THREE ACCESSORIES IN ONE FASTEN TO AUTO WHEEL



Three accessories in one, a combination oil gauge, choke and match box are contained in an instrument which may be attached to the steering wheel of a Ford. The oil gauge, adjusted on

the wheel, cannot leak, as there is no way for the oil to get out of the tube.

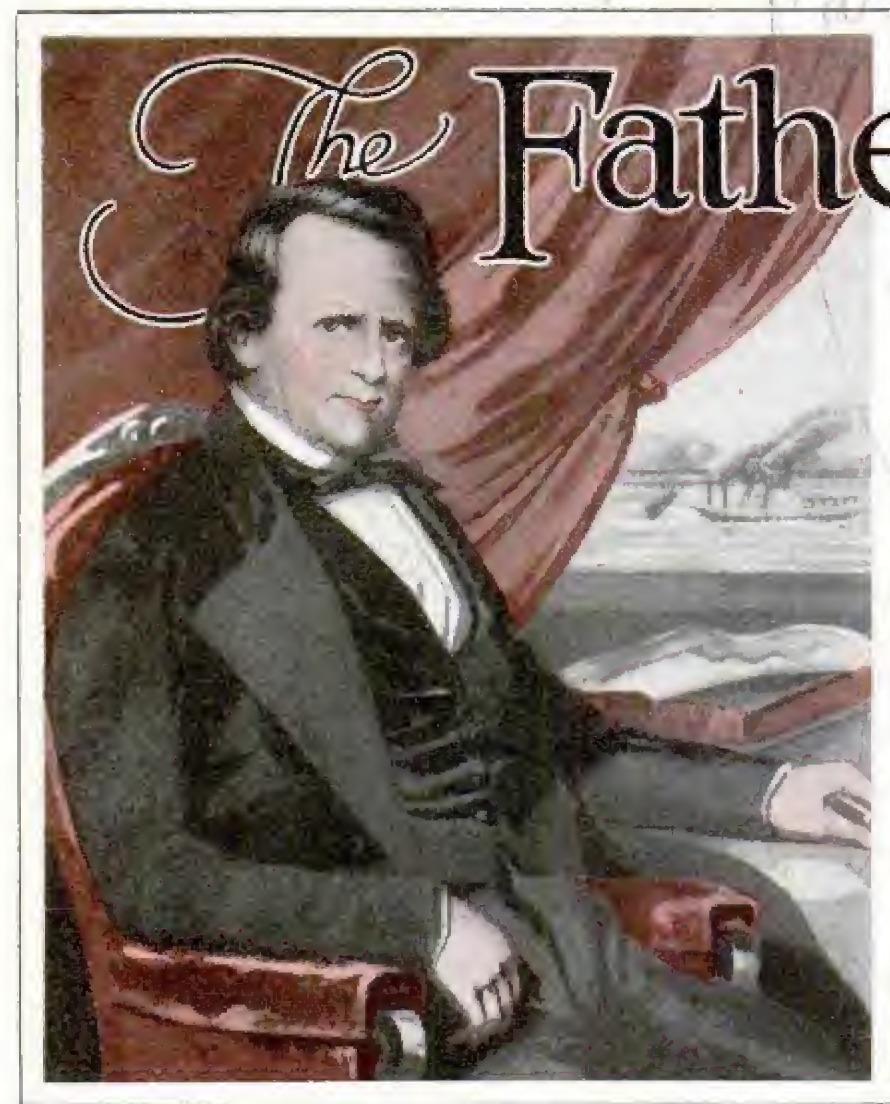
Cont. from H. L. Coleman
325 Industrial Ave.

212222 Metal
Product Co.

and Mr. Benjamin Goldberg
at Spalding School for Crippled
Children

Washington & Oakland
District, Chicago

Down to Dayton Ohio



Henry Shreve, Inventor of the American Steamboat. One of the Most Important Single Factors in the Development of the West and South

By G. L. ESKEW

Laurens, Chicago

"FROM those ways," said James Howard, indicating a long series of greased tracks sloping down from the Ohio's muddy bank. "I have seen hundreds of steamboats slide into the water. The fact is, I built a good many of them myself, though my father and grandfather were really the famous steamboat builders in the days when the fine packets plied these rivers.

"In these days, when there is a general revival of various kinds of transportation in the Mississippi valley, and the tow-boats and barges, the railroads, the airplanes and the trucks are each coming in for their share, not many people recall the old-time wooden steamboats which built up the cities before the railroads came.

"There will never again be any such fine steamboats as the 'Ed Richardson,' Cap-

tain Tobin's 'J. M. White,' the second 'Robert E. Lee,' the 'John W. Cannon,' Commodore Laidley's 'City of Louisville,' 'City of Cincinnati,' and 'Indiana.'"

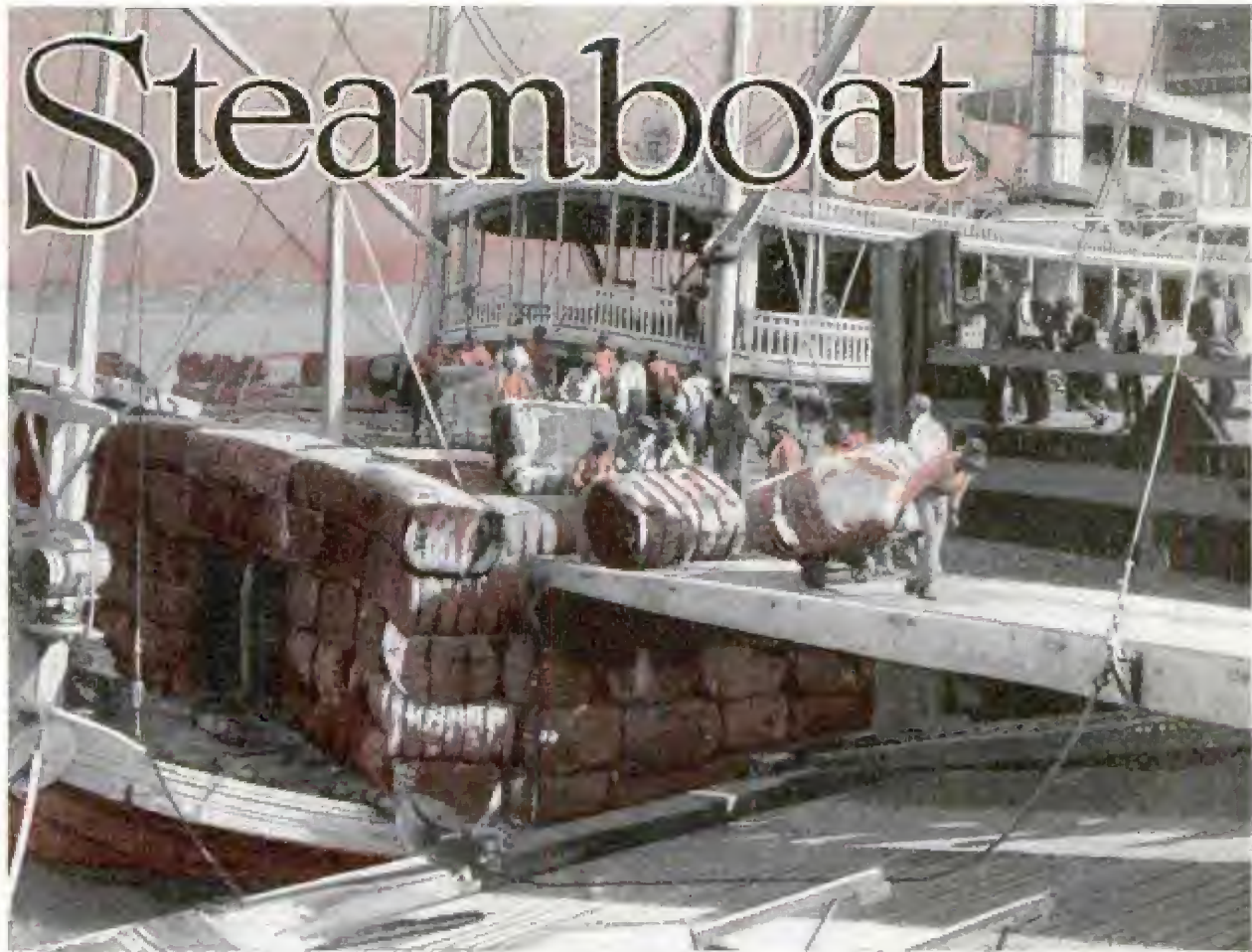
The speaker was James Howard, now president of America's oldest shipyards, at Jeffersonville, Ind. He was standing on the bluff Ohio banks watching the riveting on several huge steel barges, but his talk was all of the great white steamboats, famous in song and story, with twin tall smokestacks, tiers of cabins and jigsaw decorations, which once supplied the river cities with their sole means of transportation.

"To understand anything about steamboats," continued Mr. Howard, "you must first know that the problem of navigating the Mississippi by steam is very different from that of deep water. We have no big waves or storms, but we have shallow channels, sandbars, swift currents, in which no steamship that ever floated could operate successfully.

"In fact, it was these swift currents and shallow rivers that brought the steamboat into being. The steamboat is no descendant of the steamship. It stands by itself. Robert Fulton built the first practical steam vessel in America, the 'Clermont.' She was a deep-water craft—a steamship. Her machinery was in her hold. She had a single upright engine and boiler connecting with a shaft at right angles, which turned her side-wheels.

"The steamboat was something else altogether. The builder of the first was Henry Shreve, for whom the city of Shreveport, La., was named—a man who

Steamboat



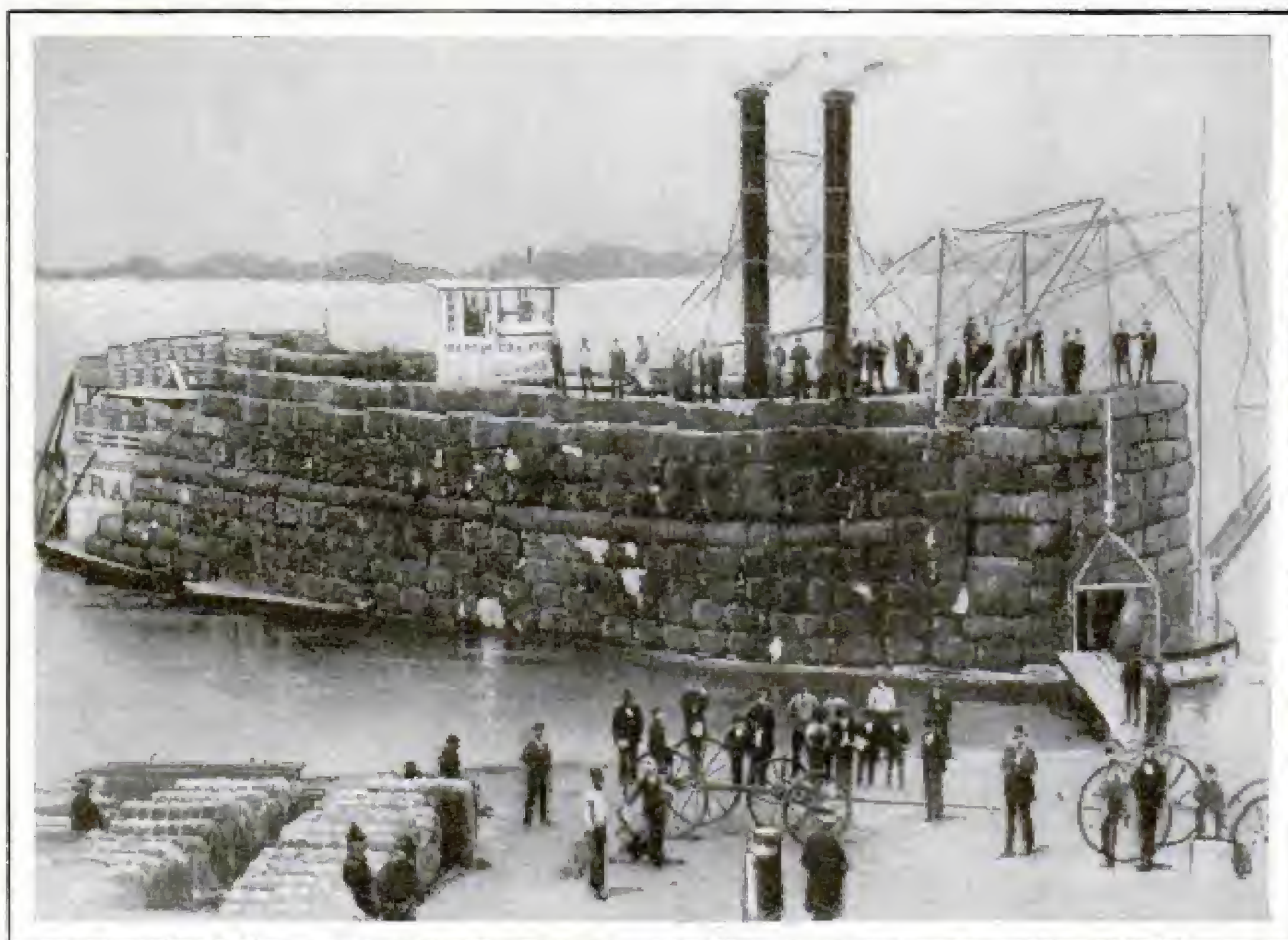
When Steamboat Traffic Was at Its Height; River Commerce Now Runs Largely to the Less Picturesque but More Efficient Barge Lines That Ply Far Northward

is practically forgotten. Yet the steamboats built on his model within thirty years represented a tonnage on the western rivers greater than those of the Atlantic seaboard and Great Britain combined.

"You might almost say Shreve learned from Fulton how not to build a steamboat; then he went ahead. For, though not many people know it, Robert Fulton and his associates came out here to the western rivers in 1812, after his success with the 'Clermont' on the Hudson river, and built several similar ships at Pittsburgh. But he failed to furnish any practical means of navigating the rivers, because he failed to grasp the fact that you can't navigate inland waters with ocean ships. Fulton sunk nearly a million dollars trying to do it. He succeeded in sending several ships down to New Orleans, but they couldn't come upstream and shortly sank or exploded. And that was when Henry Shreve stepped in and built the first steamboat, at Wheeling, W. Va.

"Shreve knew a radically different vessel from the steamship was needed to ply the rivers. He knew also from long experience that a keel boat hull was the best type for the rivers. It is nearly flat but slightly rounded, with a sharp bow. Fulton's steamship hulls, weighed down with heavy machinery, drew so much water that their keels dragged on every sandbar. They couldn't run in close to shore but had to anchor in midstream. And the Watt and Bolton engine which Fulton used was too weak to push a boat a hundred feet long upstream against a five-mile current.

"So Shreve, after Fulton's failure, set to work. His solution of the problem was simple. He merely built a keel boat hull 136 feet long, and instead of putting his engines in the hold, placed them on deck. Then, to make up for the space taken up by his machinery, he added another deck. He knew that Fulton's type of engine would never do. So he invented a new type and placed his cylinders and boilers



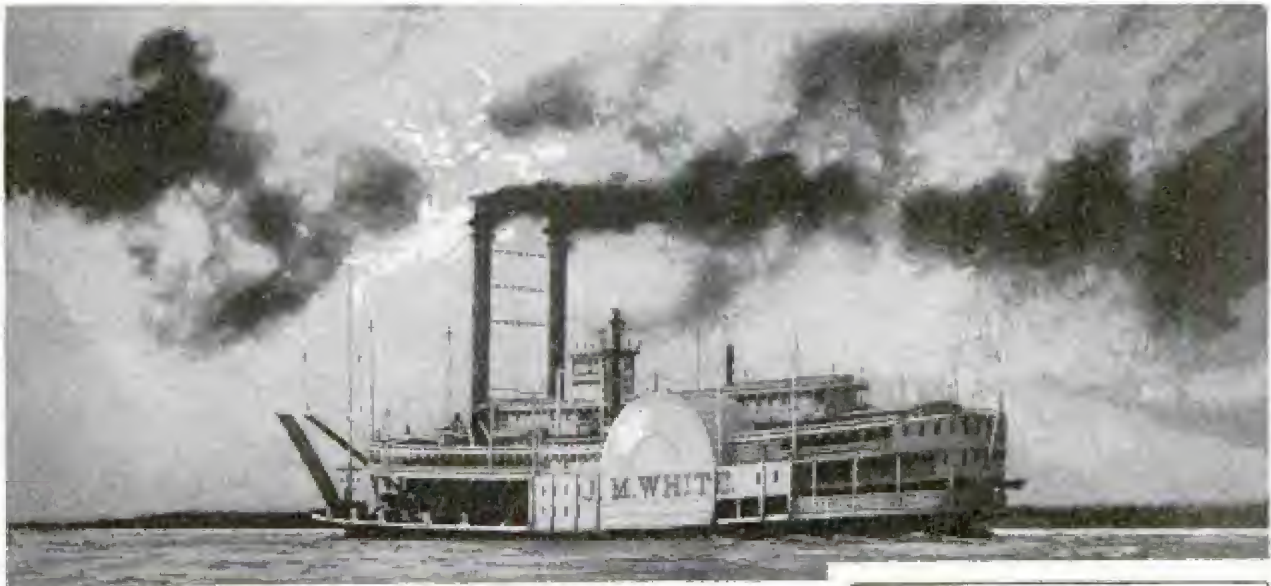
It Was the Western River Steamboat That Made Possible the Advance of the Southern States as the Chief Cotton-Growing Section of the World; a Typical Load of Olden Days

in a horizontal position instead of the then customary upright position. This new engine of Shreve's was somewhat like the engine of Daniel and William French, which had an oscillating cylinder. But Shreve made sweeping changes in it. He held the cylinder stationary, equipped the 'Washington' with double engines, unconnected, one for each paddle wheel. This enabled the pilot to go ahead on one engine and back on the other.

"That was the first American steamboat—nothing in the world but a steam-propelled keel boat, a boat to sail on the water instead of in the water. Her machinery weighed one-twentieth of the machinery of Fulton's ships. Shreve's engines could push the 'Washington,' which was as large as any of Fulton's ships, at a greater speed upstream against the current than the ships.

"Every steamboat built since Shreve's in 1817 has been constructed along the same lines. There have been a great many improvements, but the general type has remained, for the simple reason that it has proved better than any other.

"How many boats have we built in this plant? I have estimated it as best I could—no exact record was kept in my grandfather's time—and I think 2,800 would be about right. That, of course, represents craft of all kinds. Probably the most famous of all these boats was the 'J. M. White.' My father launched her in 1878 and Mark Twain and many others called her the finest steamboat of all. She was 325 feet long and her smokestacks reached seventy-five feet above the top deck. Their tops had feathery, lacelike decorations of oak leaves eight feet tall—for it was the custom to decorate all steamboats in a manner that would seem outlandish to-day. I recall that the 'Grand Republic,' another big steamboat, had a sunset scene painted on her wheel house. The 'White' had merely her name done in gold leaf in letters fifteen feet high. If you had rolled one of the 'White's' side-wheels alongside a building, it would have reached almost to the fourth floor. Her hub was a yard in diameter. The blades (we call them buckets) of her wheels were eighteen feet long. Each of her cranks weighed four



Efficient as Cargo Carriers, Many of the Famous Old Steamboats Were Also Luxuriously Equipped for Passenger Traffic

River Barges, Each with a Capacity of 2,000 Tons; Single Movements of More than 16,000 Tons Are Not Uncommon



and a half tons, and each shaft without the crank weighed 28,000 pounds. Her engines were 1,600 horsepower each and her boilers carried 120 pounds of steam.

"I'll never forget what a magnificent picture the 'White' made as she lay in the river just after completion. She had perfect balance, and that was a difficult thing to accomplish, for we had no architect's drawings in those days. The placing of her engines and wheels—the wheels aft, to balance the engines forward—gave her just the correct set. She had a rakish and yet majestic look that was the delight of every steamboatman on the river. Twenty big chandeliers on heavily gold-leaved iron rings hung the full length of her saloon. She had a hundred first-class staterooms, four bridal suites and each door was dark walnut with an inlay of white walnut and had a glass knob."

The average American's idea of steamboating has mainly to do with gamblers, renegades from Natchez-under-the-Hill, the race of the "Robert E. Lee" and the "Natchez," with deck hands sitting on a pop valve and firing the engines with hams, and with Mark Twain's delightful stories. But these same western-river steamboats, with their tall chimneys and lacy filigree ornamentation, had a serious business to attend to. Long before the railroads had come definitely to the middle

west, fine lines of steamboats were connecting Cincinnati, Pittsburgh, Louisville and St. Louis with Memphis, Vicksburg and the far south.

Their astounding capacity as freight carriers has been the marvel of steamship builders in the east. Load a steamship of the same size as a western-river steamboat with the same amount of freight you could put on one of the latter, and it would sink. For example, the "J. M. White" had a capacity of 8,000 bales of cotton, 4,000 sacks of cottonseed, a huge quantity of miscellaneous freight, 200 cabin and probably 500 deck passengers.

As for speed, not only Mr. Howard, but numerous old pilots and captains, say that the "White" was the fastest boat that ever plied the river. Every time one of her huge forty-five-foot wheels turned over in still water it set the great hull forward about 130 feet. Twenty-five miles an hour downstream or eighteen to twenty miles an hour upstream was not considered especially fast time for the big steamboats. Most any of the big packets could have done it. But one evening at five o'clock the "J. M. White" left New Orleans, made fourteen stops for discharging and unloading freight and passengers, and it was one o'clock next morning when she steamed out of Baton Rouge, 135 miles away. That was running!



Building the Steamboat "J. S." for John Streckfus, of Rock Island, Ill.; Scenes Such as This Were Common at Busy Shipyards along the Navigable Rivers of the Middle West



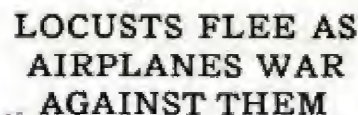
Only Known Photograph of One of the Most Famous Races in River-Steamboat History; the "Robert E. Lee" at Full Speed during the Race with the "Natchez"

The engines were geared to move slowly; fourteen or fifteen revolutions a minute was all that was necessary to send a big steamboat forward at a swifter speed than any contemporary deep-water ship. High-speed condensing machinery did not come in until later. The fact that the old steamboats worked with high-pressure engines, which moved at such a slow rate, accounts for the long life of many steamboat engines.

"Just the other day," Mr. Howard told me, "a towboat named 'New Orleans' sank near Slidell, La. The boat was formerly named the 'Louis Houck,' and was built in 1889. The machinery of the 'Houck' had been taken from the famous packet 'Thompson Dean II,' when that boat burned in 1882. Before that, the same machinery had been in 'Thompson Dean I,' when the boat was built in 1868, and any day I am expecting to hear that the 'New Orleans' towboat has been razed and her machinery salvaged to go into another boat! That will give you some idea of how long a western-river steamboat engine lasts.

"The fastest boat on the Ohio river and the prettiest was Commodore Laidley's 'City of Louisville.' She was 309 feet long and as slender and graceful as a girl. We built her in 1894 and, while she lacked the ornateness of the old boats on the lower Mississippi, she was a favorite from one end of the Ohio to the other. She and the 'City of Cincinnati' were both destroyed in the ice gorge of 1918. All the old steamboats have gone—sunk, burned, boilers exploded or worn out. The railroads took all the business away from the steamboats for a long time, but now freight traffic at least seems to be coming back to water lines, and I, for one, hope it won't be long before we see the rivers alive once more with both freight and passenger boats."

☐The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished by addressing the bureau.



One of the Highest of Many Viaducts Enabling Railroads to Travel the Alps;
Natives Call This One "The Stilts"

RAILROAD PLACED ON STILTS TO SPAN MOUNTAINS

Trains negotiating the Swiss Alps have been placed on stilts to span the mountain crags. The trains on this line twist and turn, clinging to the walls of precipitous gorges, plunging into tunnels, gliding down a spiral inside a mountain and then on stilts leaping across a ravine. One of the tallest of the mountain-spanning bridges is officially known as the Landwasser viaduct, but to all the natives of the section, because of its height, it has become "the stilts."

Names and addresses of manufacturers of articles described in this magazine will be promptly furnished, free, by our Bureau of Information.

Using army airplanes to make war on the locust hordes in the Philippines was successful until recently, when the insects, apparently by intuition, have learned to avoid the attacks. The planes were used to spray poisonous dust on the crop destroyers and, at first, left the dead in windrows on the plantations the insects attacked. Then a change came over the locusts, and when an airplane motor was heard, they vacated areas in vast swarms, often flying into the paths of the planes and constituting a real menace to the pilots. These, however, have learned that they can ride herd on a cloud of locusts and now adopt the practice of keeping them moving in a general direction, and holding them in compact formation, much as cowboys herd cattle, until they have been chased

from the crop areas. The pilots say that locust punching is good training, for the flyer must be adept to avoid the insect columns and at the same time keep the swarms moving in front of him.

**HANGER BAR ON CLOTHES HOOK
C ADDS TO CLOSET CAPACITY**

Useful in the home or when traveling, an extension hanger bar is attached to



a clothes hook without the need of nails or screws, to increase the capacity of the locker or closet. One bar is said to make an ordinary hook do the work of five. The attachment occupies but little space in a traveling bag, and is easily adjusted.

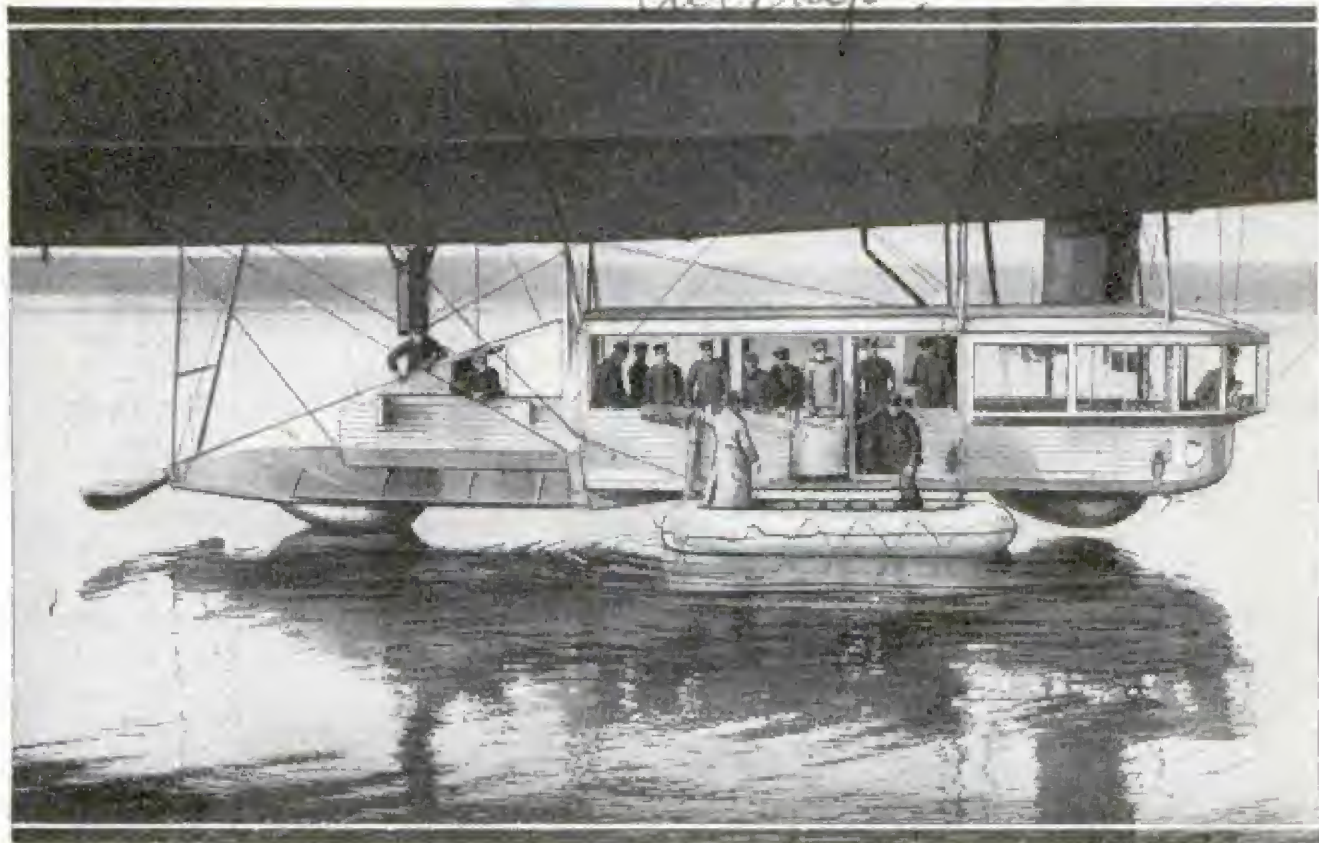
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Suggest Aircraft
POPULAR MECHANICS
Aerobics Inc. Hammondport

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The Crew of the German Dirigible, "Graf Zeppelin," Is Here Seen Transferring to One of the Pneumatic Lifeboats Which Are Part of the Safety Equipment of the Air Liner

PNEUMATIC LIFEBOATS PROVE VALUE ON "GRAF ZEPPELIN"

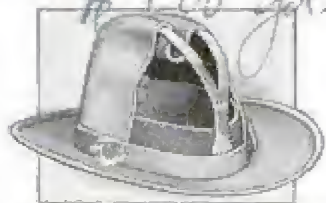
Pneumatic lifeboats, capable of carrying between forty and fifty persons, have been made a part of the equipment of the German dirigible, "Graf Zeppelin," for its transatlantic flights. The boats proved their value recently when the crew of the dirigible was able to board one of them during a forced water-landing test

FABRIC FILM TRANSMITS SOUND WITHOUT DISTORTION

Transmission of light beams, through a fabric film upon which positive sound images are recorded, has resulted, the inventor of the process says, in the reproduction of sounds without distortion. Projecting the light through the fabric medium for the purpose of translating sound images into musical or vocal sounds may be conducted either with or without motion pictures. The film, made of processed cotton, rayon, or other inexpensive materials, is said to be immune from spontaneous combustion, virtually scratch-proof and more durable than celluloid film. Images of objects may be projected

to a screen by reflected or transmitted light, the transmitted beams being employed to project the sound images recorded on the film to a photo-electric cell, where they are reconverted into audio impulses synchronized with the action of the images on the screen. The same result is obtained by reflecting the images from the fabric medium to the photo-electric cell. Use of the medium for sound translation without pictures is possible by substituting for a phonograph disk a positive film upon which have been recorded sound-impulse images, and using it with an audiophone to be attached to talking machine or radio amplifier. The greatest utility of the fabric film is expected to be in talkies and radio television.

CELLULOID RIBS INSIDE HAT KEEP IT IN SHAPE



does not damage the lining and can be removed in a second.

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1.00 for 24
Morton Breunig Co.
567-3rd St.

Penicillin Ties Delay Pulls back Pa

Chas. H. W.
Hochstetler

More Precious



Mined with picks, hand shovels, scrapers, steam shovels, electric and air drills, and dynamite, the copper ore, largely in the form of sulphides, is loaded into cars by machinery, rushed to the mills by gravity, electric current, steam or Diesel power, and there the cars are picked up bodily in great cradles, overturned into pits, rolled back on their wheels again and returned to the deposit to be refilled. From the pits, other cars rush the ores to the crushers,

By H. H. DUNN 3728 1/2

Purple Rock San Diego Cal
COPPER was the first metal known to man. Twenty thousand years before Columbus crossed the Atlantic, men mixed copper with zinc, silver or tin, and made for themselves a Bronze Age.

In 1927, modern man, outflying the birds, controlling the lightning, thwarting the hurricanes, prisoning history in celluloid, making the ether entertain him, demanded more copper than he did gold. The production of the red metal in the United States for that year—the last on which complete figures are available—sold for \$220,609,000, while all the gold mined here in the same year was worth only \$45,418,000.

The inventive genius of man created the colossal demand for copper. Mechanical ingenuity responded by devising new methods whereby the miners of the United States wrested from the hills and mountains 752,000 long tons of the "penny metal." Except in the production of steel, there never has been applied to any ore the high-speed methods of the copper mine, mill and refinery.

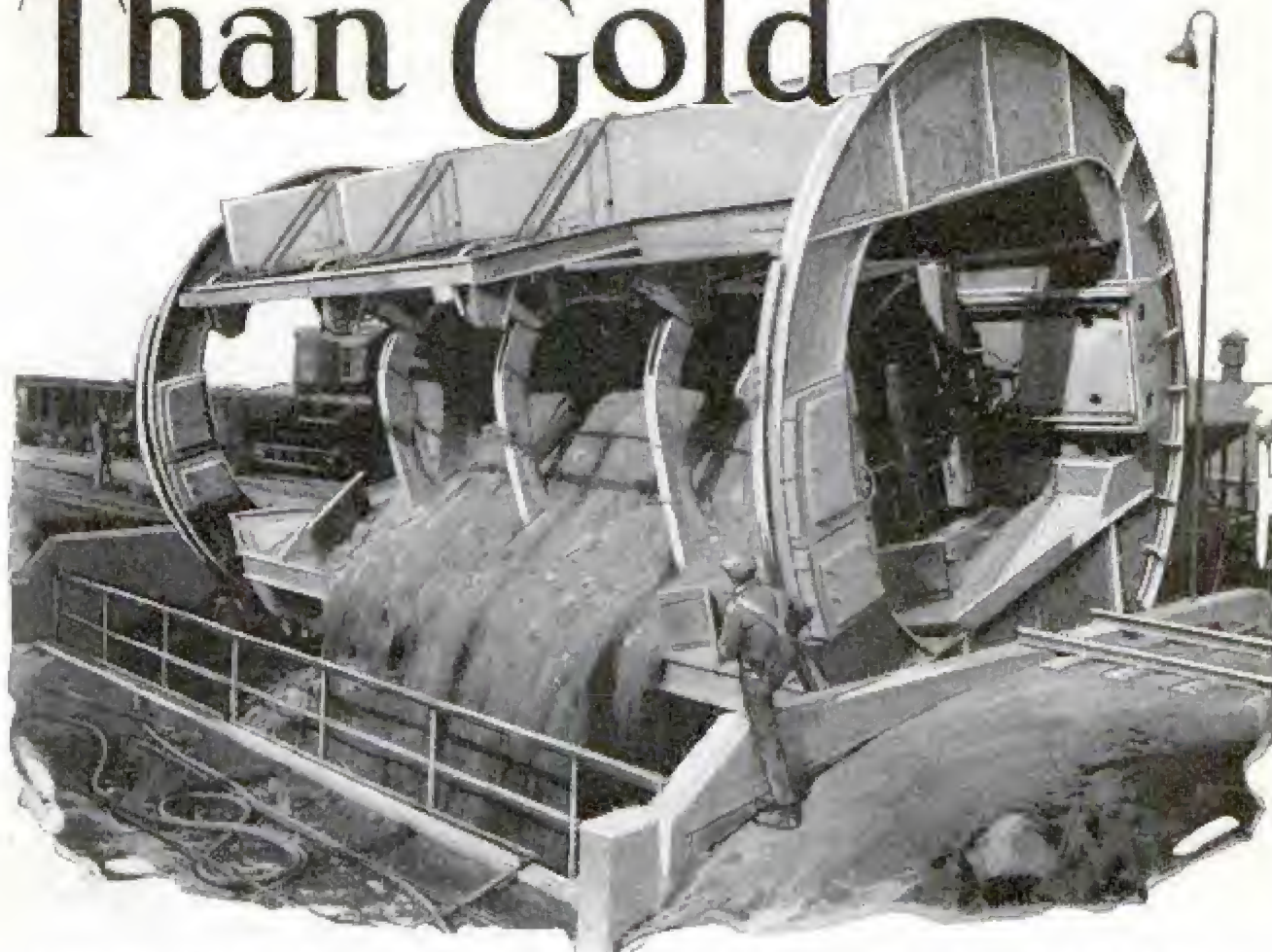


"Gophering" a Vein of Copper and Hammering a Spear Head; from Life-Size Restorations in Museum

where, when the stone has been ground fine enough, automatic metal watchmen release it, refill the crushers, mix water with the powdered ore and send it to the concentrating tables.

Thence, through the furnaces and the converters, and all the other equipment, of the largest and most costly ore mills in the world, machines, which all but regulate themselves, pass on the gradually

Than Gold



Rotary Car Dumper to Speed the Unloading of Ore: by This Method About Five Times as Much Material Can Be Handled in a Day as Was Possible with the Drop-Gate Cars

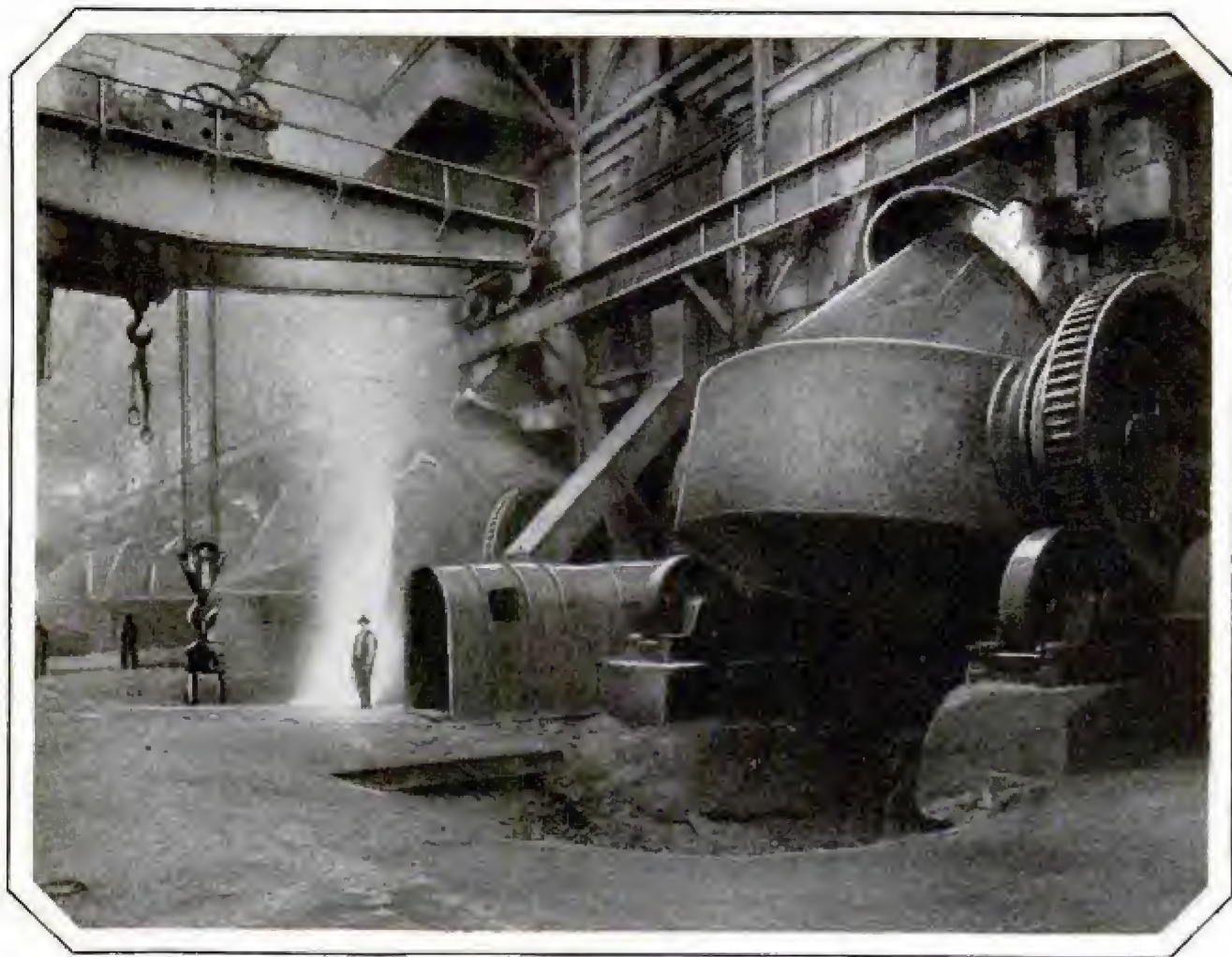
cleansed metal until it comes out in "pigs" so pure that only chemical analysis could reveal its impurities. Copper production developed to such an extent that four times as great a quantity can be made in one eight-hour day this year as could have been made six or seven years ago.

Copper is found in almost all soils, and in myriad ores which are worked for other metals. It occurs in many mineral waters, in seaweed, the blood of man, and in certain creatures of the sea. Analysis reveals it in hay, straw, eggs, cheese and other foodstuffs, as well as in the liver and kidneys of most animals. It appears as "native," virtually pure, metal in the forms of filaments, thin sheets and lumps, one such lump weighing 400 tons having been found in the Lake Superior deposits. Sometimes it bears native silver imbedded like crystals in rocks. But the great value of copper, and the main reason why the world draws more than sixty per cent of its copper from the United States is that

its electrical conductivity is the highest of any of the non-precious metals. Yet, in point of value and of ingenuity devoted to its production, copper is in reality one of the most precious metals in the world.

A modern copper mine, as developed with the latest equipment, is a good-sized town in itself, literally an inverted community skyscraper, stood on its head half a mile or so in the earth. Three forty-story buildings, placed one on top of another, would not reach from the surface to the lowest workings of the deepest mines in Montana or Arizona. Still like a mammoth office structure, such a mine is provided with elevators, called "cages," which drop the hundreds of miners to their various levels and bring them back when the day's or night's work is done.

There are some mines on the surface, where whole mountains are blasted down, from the top to the bottom, without the men once entering a shaft or a tunnel. There is another in which the ore is so



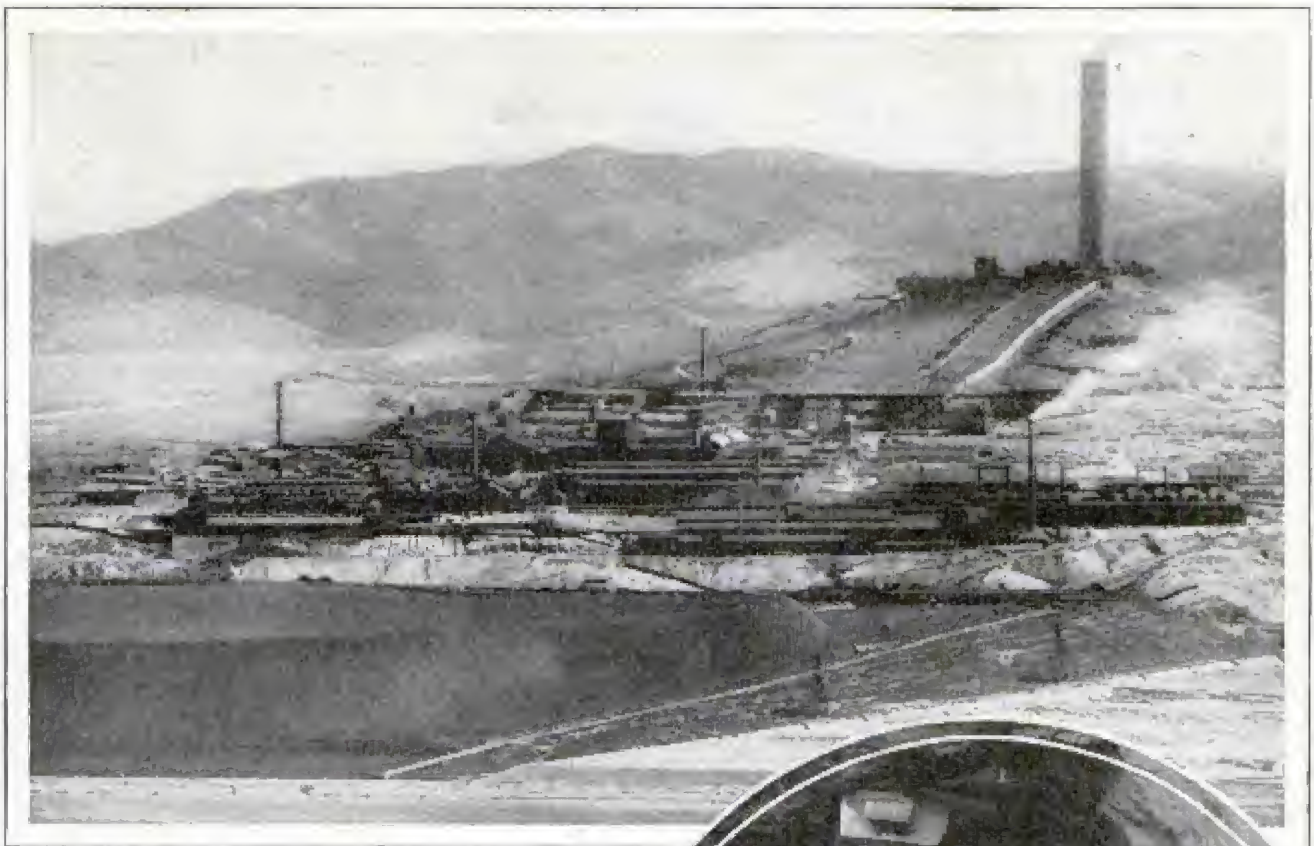
Converters Which Put the Final Touch to the Smelting Process in the Production of Copper; the Precious Metal Is Separated from Waste Materials Which Take the Form of Fumes and Slag

broken and soft that it is taken out with scrapers and steam shovels. Geologists estimate that this deposit, though of low grade, contains enough copper to supply the demands of the United States for at least 100 years.

But, in the majority of the copper mines, the miners at the "heads," that is to say, the inner ends of the tunnels which are driven to follow the veins, ride to their shifts down the automatically controlled cages, protected by safety devices which prevent falling more than one level, or "floor," in the great inverted structure. Arrived at his level, the miner steps on a small car, driven by a motor from a storage battery carried on board, and rolls away to the "face" of the working. There, he finds a compressed-air, or an electrically driven, drill set up, looking like a machine gun and working like a riveter's pneumatic hammer. With this, he drills eight to twelve holes, each an inch or more in diameter and six to eight feet in depth.

Into these holes go slender, yellow sticks of dynamite, looking as if they might have been designed for church candles and then changed their minds. Copper detonating caps are set into the ends of these sticks; copper wire carries the electric current to them, and a copper switch is thrown when the "buster" does its job. Thus refined copper is put to work to bring out and purify unrefined copper from the backbone of the world.

The blast breaks down the rocky wall, bringing about forty pounds of the red metal with each ton of stone and earth, and copper is worth, at the factory, rather less than twenty cents a pound. Only the highest of mechanical ability applied through the most modern machinery can make such mining profitable. Men shovel the broken "trap rock" and ore into little cars, which run electrically through the tunnel and to the shaft, where they stop and dump their burdens into big steel "skips" or buckets, which lift them to the waiting bins above, if the mill is at the



Huge Copper Smelter and Mills at Anaconda, Mont.,
and Boring Holes for Blasting

mine entrance. If it is at a distance, each skip drops its load into a steel gondola, very little smaller than the standard railroad car, which dashes down the hill, along with half a score of similar cars, and rolls into a huge steel cylinder, at the mill. As the gondola enters this roller, which has tracks to receive it, the car is detached from the others of its train. A man at one end of the cylinder pulls a lever, the cylinder turns, car, load and all, and the ore is dumped into a bin. The cylinder rolls back until its tracks meet those of the railroad, the empty car runs out, a full car runs in, and four cars are unloaded by one man in the same time that two men would have required to unload one car by the former method of opening a door in the bottom of the gondola. This is just one of the comparatively new devices which has made low-grade copper ore commercially workable.

The greater part of the copper ore mined in this country is in the form of a sulphide of copper, in which the red metal is mixed with iron and sulphur, and, usually, with some silver and a little gold. There are copper mines in which the gold and silver almost, or entirely, pay for the mining of the copper. Attached to every



copper mine is a laboratory, and from every carload of ore goes a sample to it for analysis. On this laboratory work depends much of the success of the mine, mill and smelter.

From the bin, the ore falls by gravity into constantly moving trains of steel cars, which carry the copper on its first jour-

ney in the complicated treatment which is to free it of other metals and of all impurities. It goes first to the concentrating mill, where, between great steel jaws and under the pressure of hundreds of tons, it is crushed to a powder, breaking down the rock structure to a fineness in which every particle may be made to yield its hard-held metal. Then the powder, as yet untouched by the hand of man, is mixed with water and passed to the shaking tables, where the lighter and valueless rock, and the free impurities, are washed away, leaving all the metallic values in the wet mass, known as "concentrate." Having been well soaked until it forms an almost solid sludge, the concentrate then passes by automatic, self-loading elevators, watched by one man, to the open tops of the roasting furnaces, whence the mass falls to the first hearth, where it is dried and oxidized. Blades, moving almost like human hands, slowly work the mass to holes in this hearth,

which are conserved and used, in most modern copper plants, for the manufacture of sulphuric acid as a by-product. The burning of the sulphur furnishes all the heat required for the operation of these six-story roasters. Showing a dull red color, the calcine then passes in covered steel cars, into which it is poured automatically from the roasters, to the reverberatory furnaces for the actual smelting.

By this time, the calcine contains forty per cent, or more, of copper, and is fed automatically and mechanically from the cars into the "reverbs" as copper-minded engineers call the furnaces, maintained by oil burners, again thermostatically controlled, at 2,800 to 3,100 degrees Centigrade, inside temperature. Inasmuch as this is about half the heat of the exterior of the sun, it is wasted energy to ask the furnace superintendent if "it's hot enough for him." In each of these furnaces bubbles and rolls from thirty to fifty tons of liquid

ore. In this roaring caldron, the copper calcine loses the remainder of its sulphur, and virtually all of the other waste products, with some of the iron. Most of the iron in the copper ore, however, combines with the copper to form what is known as "matte," the valuable product of the reverberatory furnace.

Traveling on rails or by crane, the matte, consisting now in large part of a mixture of copper and iron, comes



through which it falls, one by one, to five other and lower hearths. So the former concentrate emerges at the bottom as "calcine," with approximately seventy per cent of the sulphur driven off in the form of gases,



Floating Off Slag and Clinkers at a Copper Smelter, and a Few of the Odd Forms of Copper Money Used Many Years Ago



Where Low-Grade Copper Is Mined with Steam Shovels and Sent in Trainloads down the Zigzag Tracks by Gravity to the Smelters; These Hills Contain Enough Copper to Last the United States 100 Years

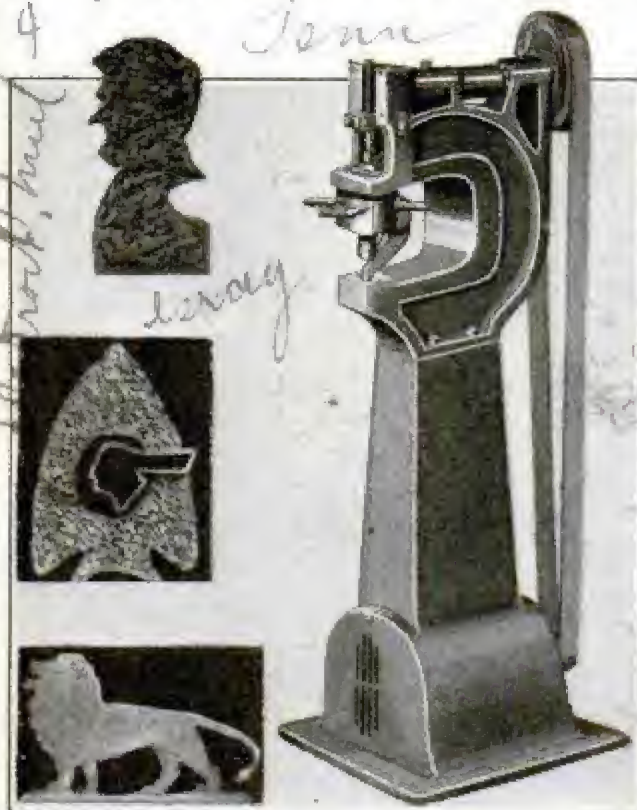
to the converters, steel barrels, the noisiest, and one of the most important, parts of the smelter. The mouth of one of the converters stands open. The great pot, filled with six tons of matte, swings into position. A hook drops slowly from the crane and engages an eye in the back of the ladle. The man in the crane housing touches a copper switch and an auxiliary motor tilts the pot in mid-air. A silvery-white stream slips into the converter, until the big ladle is bottom up. Then it is righted, to roll back to the reverbs.

The man at the controls tilts the open end of the converter forward into its section of the great flue, turns on the air blast, and the removal of the iron from the matte starts. The working through of one load of matte in a converter is called a "blow," and requires about four hours. During the latter part of the blow, the last of the waste materials, whatever they may be, are burned out, leaving only metallic copper, very nearly pure, in the huge steel barrel. The moment at which this purification is complete is the dra-

matic peak of the production of copper. To know when it arrives requires years of experience and an eye trained to fine skill in the detection of shifting colors.

Unlike the amateur cook, the foreman cannot poke his finger in the cake to see if it is done. Instead, eyes fixed on the flames, the foreman waits. It is an ill time to speak to him. Orange, yellow, red, white flames come out of the converter mouth and roar up the great flue.

As a blue flame blots out the other colors, the foreman waves a hand. In a control room a hundred feet away, another watcher throws a switch. The air blast is shut off. A motor hums, the great barrel tilts and rolls over. Through the bluff snout the interior glows with a light on which no man may look and see again. The opening drops lower. The foreman slips on heavy amber goggles. Just over a flat car of molds, the converter mouth pauses, sinks a trifle, and out rushes a stream of pure molten copper, too brilliant to be gazed upon, too hot to handle by other than mechanical means.



Metal Cutter and Samples of Some of Its Work; It Saves Time in Preparing Stencils and Templates

MOTOR-DRIVEN METAL CUTTER SAVES SHOP TIME

For cutting templates, simple or intricate shapes and patterns in metal, a motor-driven cutter now on the market has been found serviceable in many shops. It takes three thicknesses of metal, vibration has been reduced to a minimum, and a special turret head may be adjusted to eight fixed cutting positions or used free to cut in any direction without turning the material.

CURVED JAWS ADDED TO VISE GIVE BETTER GRIP

Adapted especially to holding pistons or similar objects of cylindrical shape in a vise, curved jaws now on the market are easily and quickly attached or removed.



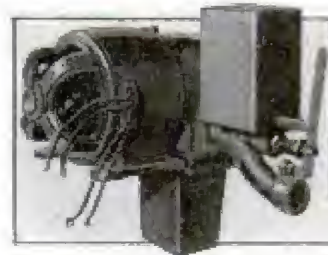
They are lined with a heavy canvas fabric that can be replaced when it becomes worn. The jaws are well adapted to work on horns, small electric motors, clocks, meters and other units.

NAPHTHA DEADLY AS DYNAMITE WHEN MIXED WITH AIR

Scientists, warning against careless use of naphtha, gasoline and benzine in the home, have estimated that one gallon of naphtha mixed in proper proportions with the air, is as dangerous as seventy-five pounds of dynamite. Naphtha will flash at any temperature above zero and one gallon evaporates into 1,600 cubic feet of vapor, the range of explosibility varying from five to twenty per cent. Even when not in a condition of explosibility, the vapor can flash and burn. The vapor settles and stratifies, traveling along the floor as an invisible danger, so sensitive that it can be exploded by a spark from a cat's back. Naphtha and gasoline both have the ability to build up static electricity by coming in contact with solids, developing a spark that ignites or explodes the vapors. The washing of garments in naphtha is subject to this danger, particularly silk and wool, as these materials may be very highly charged. Straining the liquids also may develop static electricity. Necessary precautions in using naphtha include measures to eliminate friction and avoiding a flame even in the vicinity, keeping the air humid to dissipate the static, and grounding of any solids that may be likely to develop static by frictional contact with the liquid.

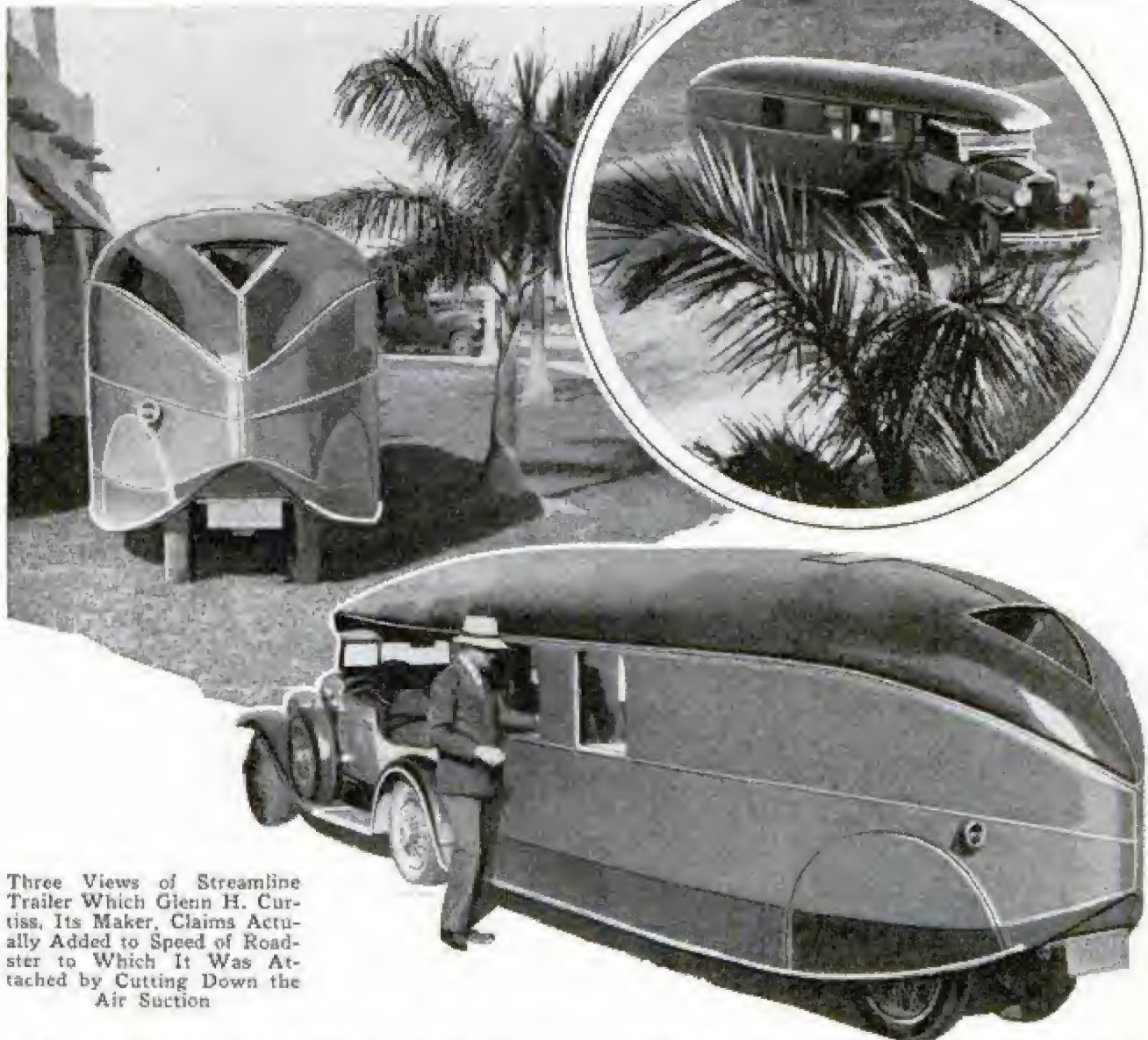
WATER-FAUCET LIGHT PLANT SERVES IN EMERGENCIES

Emergency lights of theaters, schools, hotels and other places, are automatically lighted when the regular source of



current fails by a special generator unit, operated by water power from the city mains. By means of a device on the control panel of the unit, the generator is started as soon as the regular current is cut off. This causes a needle nozzle to open, the water wheel is turned and, in three minutes, according to reports, the generator is supplying full voltage to the emergency lights over the exits and at other locations.

Utilities Service, Inc.
Smyrna, Pa.



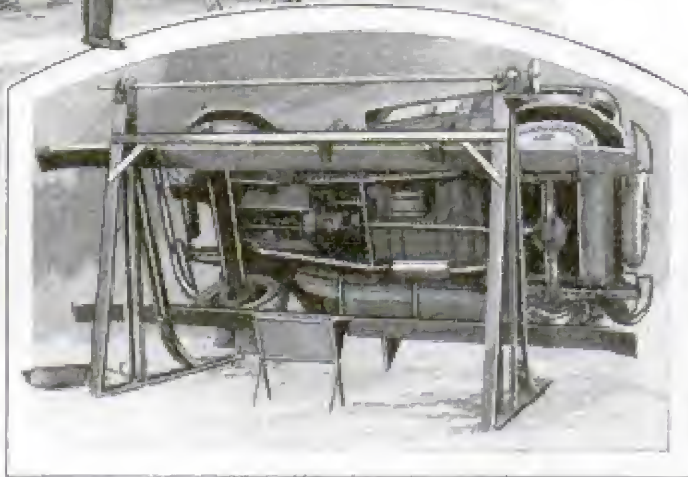
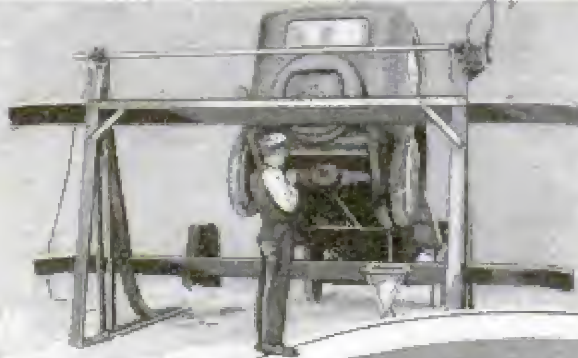
Three Views of Streamline Trailer Which Glenn H. Curtiss, Its Maker, Claims Actually Added to Speed of Roadster to Which It Was Attached by Cutting Down the Air Suction

Believing that the speed of automobiles may be increased by streamlining, Glenn H. Curtiss, airplane manufacturer, has experimented with a luxurious trailer which he calls an "aerocar" because its lines follow those of the airplane. Attaching the trailer to a roadster capable of making seventy-five miles an hour in tests, Mr. Curtiss said that the roadster with the added 1,500-pound trailer, increased its speed to eighty-three miles per hour. This increase he attributed to the streamline effect which obliterated the suction, or vacuum, following in the roadster's wake and tending to hold it back. When automobiles begin following airplane styles, he predicted, travel will be speeded up 100 per cent. Friction and head resistance are all that prevent a car traveling at far

greater speeds, said Mr. Curtiss, adding that at high speeds eighty per cent of the engine's power is used to overcome head resistance. The aerocar, light in weight, has only two wheels and provides seventy-five square feet of floor space. "We have been grossly extravagant in motor-car design," said the airplane maker. "With a cumbersome motor, over a ton of steel and an array of nickel trimmings, wheels, oversize fenders, lights and fittings, it still costs more to travel a mile than it did with a four-horse team and coach a century ago." Compared with the horse-and-buggy age, he said, the automobile has gained only in power and reliability.

☛The Dead Sea in Palestine is the lowest inland depression in the world.

see Feb. 1929. 206.



Mechanical Hoist Which Tilts Automobile on End or on Its Side, Making All Parts Easily Accessible for Repairs

AUTO HOIST TILTS CAR ON SIDE FOR EASY INSPECTION

For easy access to the under chassis, an automobile hoist now on the market tilts the car on its side or end, thus eliminating the necessity of crawling beneath the car or working on it from a pit. The device consists essentially of an iron frame with a runway platform onto which the machine is driven and fastened. The platform is attached to two arms operated by a motor, which tilt the car to an almost vertical position if necessary. The hoist raises any car up to 7,000 pounds, allows easy access to all parts by the mechanic and inspection of the car or of the mechanic's work by the owner. By being able to tilt the car at any angle, mechanics find their work simplified even when working on the top of the motor, as they may remain in a standing position.

DEAD SEA TO YIELD BILLIONS IN MINERAL TREASURES

Vast mineral resources of the Dead Sea are to be released to the world by a syndicate which has closed a contract with the British government. The body of water, 1,300 feet below the level of the Mediter-

ranean and now only forty-seven miles long, although at one time it was 200 miles in length, is estimated to contain 2,000,000,000 tons of potassium chloride, six times that much common salt and large amounts of calcium and magnesium chloride and magnesium bromide as well as gold worth \$50,000,000,000. It is proposed to use vast shallow pans, square miles in extent, in which brine from the sea will be evaporated in the sun, first producing gypsum followed by crystallization of the salts, after which the remaining water will be drained into other pans to form potash and magnesium chloride.

The cost of production is expected to be little, but transportation is a big problem. Although the Mediterranean is only forty-seven miles distant, Jerusalem, end of the railroad line, is more than 3,000 feet above the Dead Sea. It may be necessary to build a fifty-mile railroad. The French also have proposed to generate electrical energy necessary for the extraction of bromine by conveying water from the Mediterranean to the Dead Sea to supply power.

HOLDER ON EDGE OF GOLF BAG PROVIDES PLACE FOR TEE

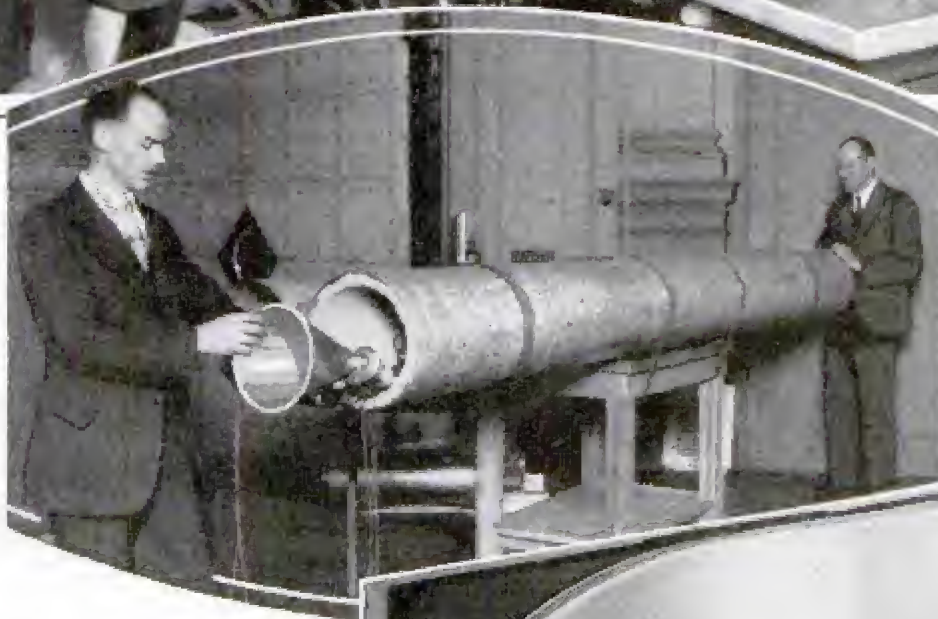
Golfers accustomed to search through their pockets for wooden tees now have a place to store this little contrivance. A spring holder for the tee clips over the edge of the golf bag, and the tee, when inserted in the holder, is kept secure and is extracted easily by pulling it sideways.



Clipping

Cannot locate

HOW ECHOES ARE FOUND IN UNBUILT BUILDINGS

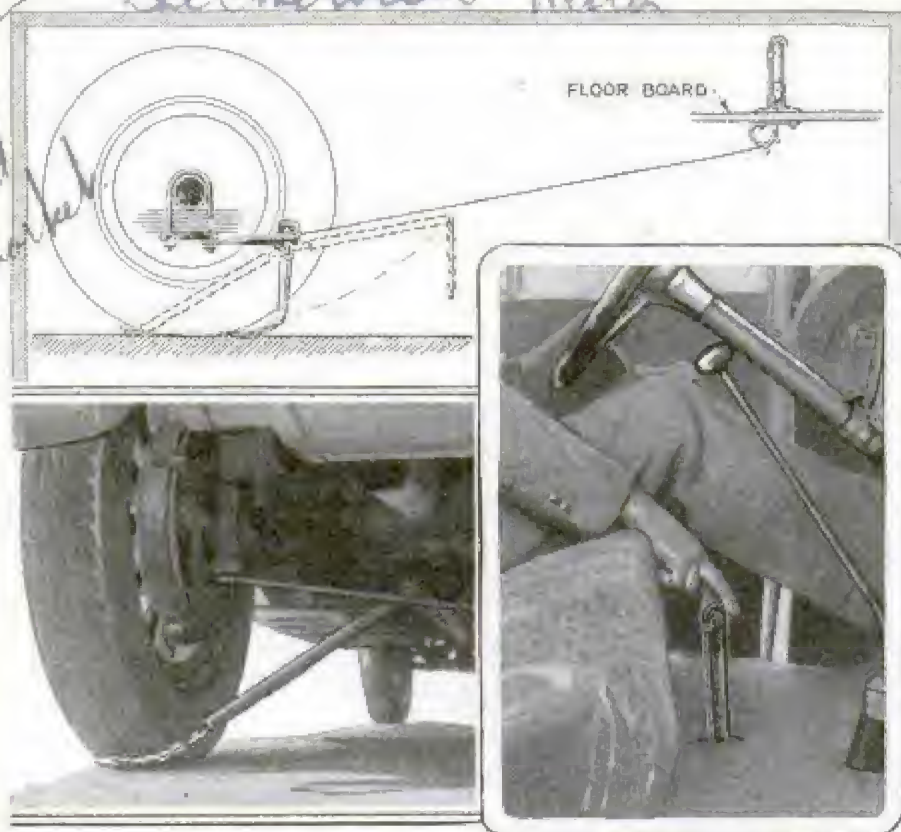


Testing Intelligibility in a Lecture Room; Insulation Is Spread across Some Seats, to Control the Period of Reverberation, an Acoustimeter Checks the Energy Level of the Voice, and a Pendulum, in Front of the Table, Is Used to Regulate the Speaker's Rate of Diction



The Effect of Insulation in Deadening Sounds in Ventilation Ducts of Apartment Houses, Was Illustrated before the New York Electrical Society by Drawing a Loud Speaker, Mounted on Toy-Train Wheels, through an Insulated Pipe; the Tin Model of a Proposed Auditorium, at Right, Was Used, with a Small Light, to Illustrate Echo Locations by Reflection of Light Beams





Photographs of the Chain and Control Lever, with Drawing to Illustrate the Entire Installation and Its Operation

LEVER OPERATES SAFETY CHAIN FROM DRIVER'S SEAT

Safety chains are placed under the rear automobile wheels by means of a lever operated by the driver, and are removed in the same way, saving getting out of the car and providing an emergency aid that helps prevent accidents. The chain does not pass around the wheel but under it, through the action of the lever and spring apparatus provided with the installation. When the wheel has passed over the chain, the spring pulls the links out, whirls them around and lays them down in front of the car for another operation. The entire assembly weighs but eighty pounds.

RESERVE TANK FOR MOTOR OIL SERVES ON LONG TRIPS



To hold a supply of your favorite brand of motor oil when taking a long trip, a patented reserve tank holding two and one-half gallons is attached to the

motor by the head bolts. The top is of the air-vent type, allowing the oil to flow freely when the petcock is opened into the motor. The pipe from the tank is of flexible tubing, and there is a gauge which indicates how much of the contents has been released.

STEEL FLOORING TO INCREASE STRENGTH

Steel-plate floors for office and other buildings are being investigated by the American Institute of Steel Construction as a means of obtaining greater strength and stability in tall buildings, reducing the loads on the columns and giving

greater protection against possible distortion due to wind stresses. According to Lee H. Miller, chief engineer of the institute, it is proposed to develop a welded steel floor which will stand every service to which it may be subjected. The steel plates would be covered with cork tile or other material.

HOLDER THAT LIGHTS CIGARETS SAVES USING MATCHES

By pressing a button, cigarettes are dispensed from a special holder now on the market and, as they fall into a small rack at the bottom of the container, an electrical connection is automatically made so that the cigarette is lighted. The current is turned off automatically when the cigarette has burned about one-sixteenth of an inch. Pressing the button is the only operation required to obtain the cigarette and have it lighted.



And Frank Walker,
654 E 60th St.

And Harry Main
204 Broadway



These Eight-Inch Guns, Mounted on Railroad Cars, Boomed Defiance at a Fictitious Enemy, Intent on Attacking Washington from the Sea during Recent War Maneuvers

GREAT GUNS ON RAIL TRUCKS GUARD THE CAPITAL

Eight-inch cannon, mounted on railroad cars, were used recently at Cape Henry in maneuvers to resist an attack by a fictitious enemy fleet intent on proceeding up the Potomac river to lay waste Washington. The railroad guns were manned in the battle practice by coast artillery contingents of Fort Story, Virginia.

SECRETS OF SUPERWARSHIPS REVEALED IN ENGLAND

Deck armor, more than six inches thick, protects two British warships, recently completed, from aircraft bombs and also from high-angle fire from other vessels. This armor, on the capital ships "Rodney" and "Nelson," is more efficient than that built into any other vessels. In addition, the ships have a main belt of armor, fourteen inches thick, around vital parts of the boats and the armor protecting the gun platforms and magazines is even thicker. In an effort to save weight in construction so that heavier armor could be used, lighter metals were substituted where possible, and even the heavy furniture was

redesigned in lighter woods, while weather decks were sheathed in Douglas fir instead of teak. The boats are armed with nine sixteen-inch guns in three turrets, twelve six-inch guns in six turrets, six anti-aircraft guns, eight two-pounders and have two submerged torpedo tubes.

ADJUSTABLE THREADING TOOL SAVES TIME AND MATERIAL

Capable of adjustment to any size bolt up to one inch, a thread chaser, or rethreading tool, eliminates much waste in time, labor and material for mechanics and repairmen. Cutters and guides are contained within the body of the tool, and the cutting unit is adjusted by turning the



Thread Chaser, or Rethreading Tool, Which Makes New Threads for Bolts up to One Inch

handle of the compact instrument. The tool is capable of chasing standard as well as special threads.

Chicago Tribune

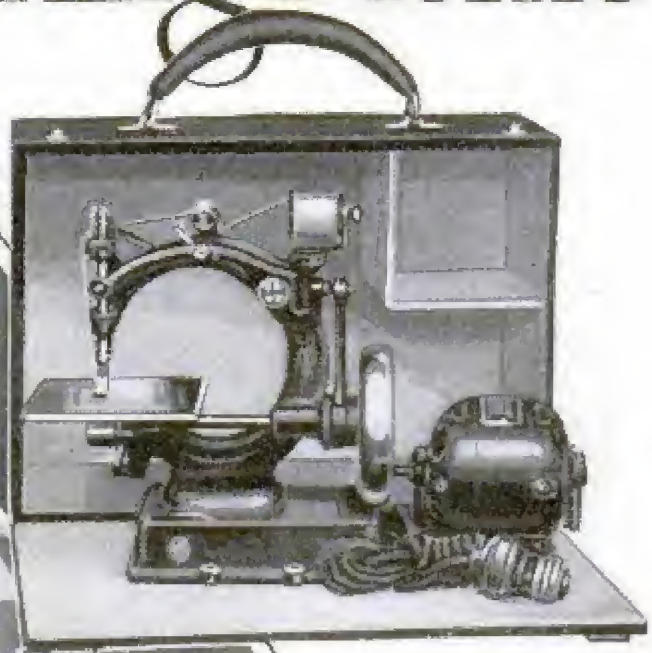
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order to 794
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Lyndee
Oberhelley, Calif
June 1st 1924

269

Making Home



It Weighs Only Ten Pounds and Fits in a Case One Foot Long; the Portable Electric Sewing Machine, Operated by Hand or Knee Control on Direct or Alternating Current

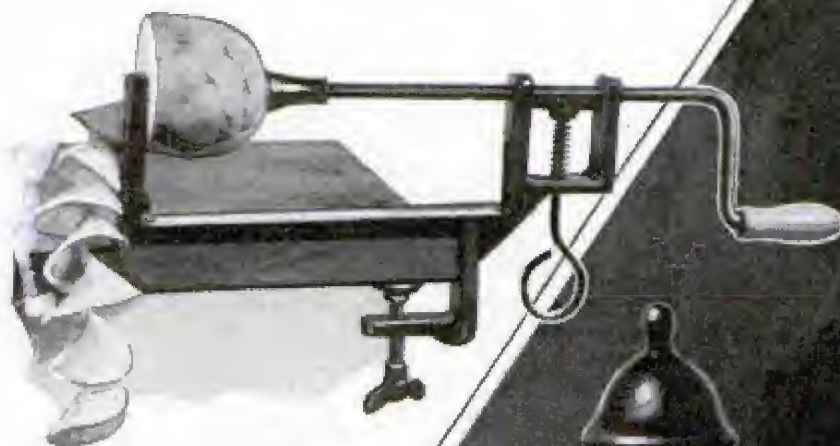
To Save Time and Work, This Serviceable Floor Brush Has a Drying Attachment as Shown; Below Is an Efficient Water Filter Adaptable to Any Faucet or Sink without Obstructing the Field of Operations



Compact and Simple Laundering Machine Does a Small Washing or Dry Cleaning with a Special Fluid That Is Non-Explosive and Efficient

Air

Tasks a Pleasure



Potato Chips at the Turn of a Crank; This Adjustable Slicer Prepares Carrots, Turnips and Other Vegetables; Below, at Right, Is a Baby's Bottle Warmer That Brings the Milk to Exactly the Right Temperature with Water, Electrically Heated, in the Outer Chamber

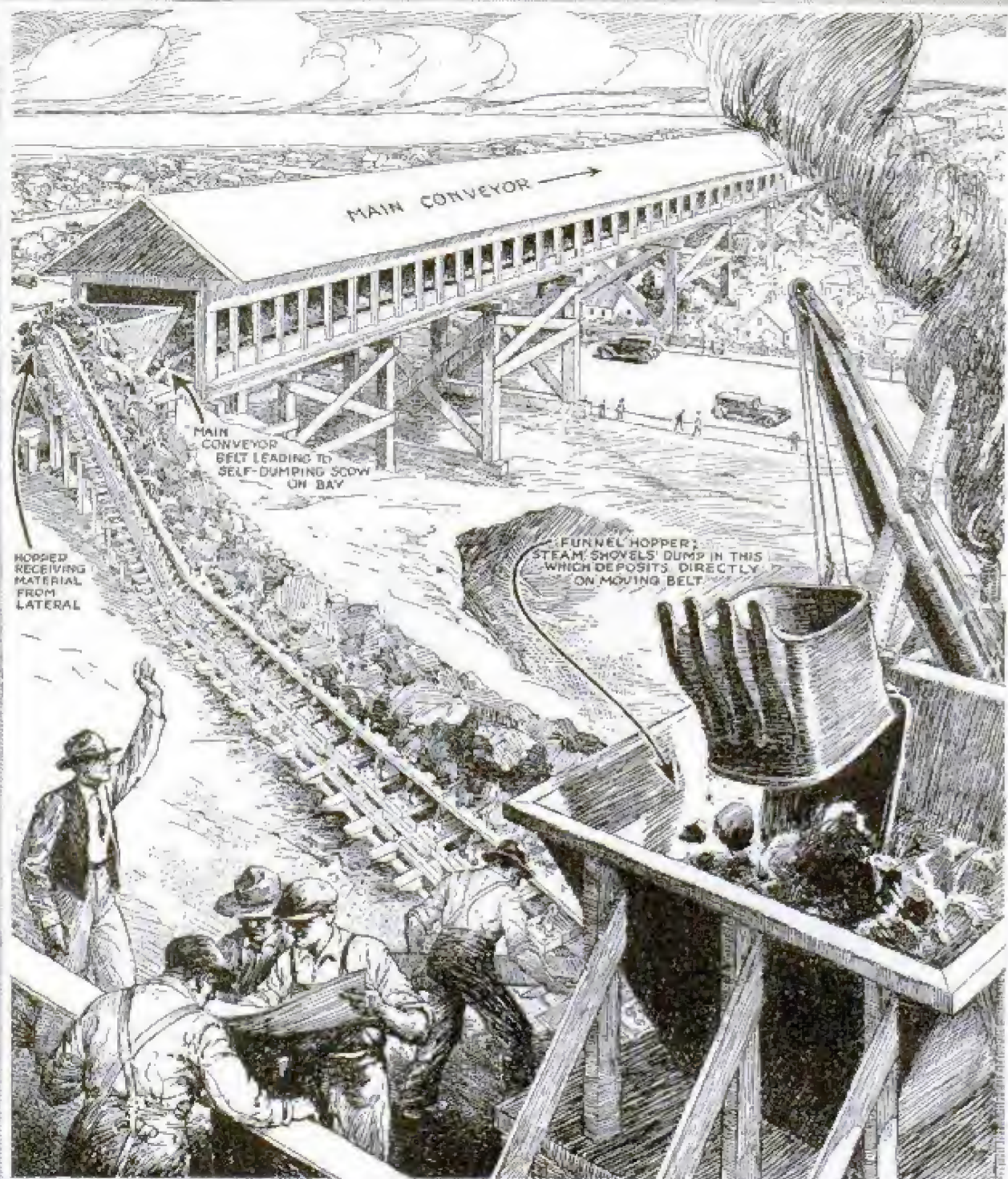


Made of a Special Waterproof Fiber, the Apron Illustrated Above Saves Laundering, as It Is Wiped Off with a Damp Cloth When Soiled



At Left, a Chemically Waterproofed Bag with Moisture-Retaining Inner Part for Keeping Vegetables Fresh and Sweet in the Ice Box, and, at Right, a Non-Separating Link for Bath-tub and Washbasin Plug Chains





Drawing of the Hill-Moving Job at Seattle; Dirt Is Being Dumped into the Hopper for Conveying to the Permanent Line over the Streets, Where It Is Finally Emptied into the Dredges

CITY HILL MOVED OVERHEAD WITHOUT STOPPING TRAFFIC

Moving a hill from the heart of a city, carrying it over streets without interfering with traffic, and dumping it from barges that turn turtle to empty themselves, is an interesting engineering task in progress at Seattle, Wash. The project involves the handling of approximately

4,500,000 cubic yards of earth and transporting it more than a mile to the bottom of Elliott bay. Motor trucks, hydraulic pumps or flumes could not be employed because of the congested downtown district from which the hill is being removed, so an overhead conveyor, into which the dirt is dumped from portable units, was constructed over the streets to the loading line at the water's edge. The conveyor

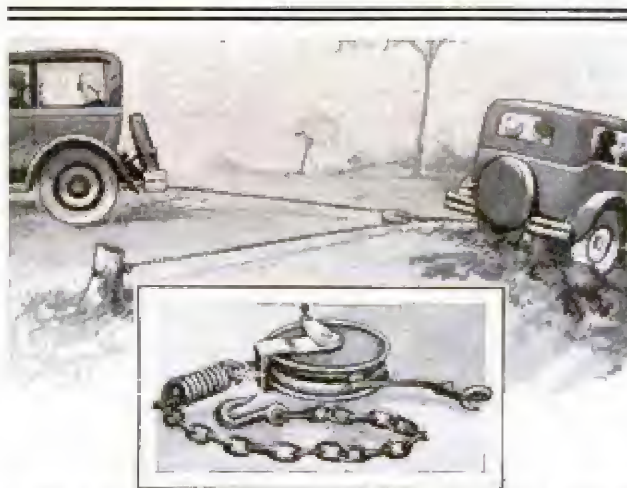
belts are run by electric motors, installed and constructed to eliminate noise, and the overhead trestles are tightly boxed in to prevent dust from sifting down upon the heads of persons walking below. Earth is removed in electrically driven shovels and deposited in the smaller conveyors, which feed the fixed unit that passes over the streets. The barges are especially designed for this job. When they are towed to the spot where the load is to be dumped, sea valves are opened and the barges capsize. Water remaining in the top side drains out during the return voyage so that the barge is ready for another load by the time it reaches the hopper at the end of the conveyor. Engineers estimate that nearly 400 working days will be required to complete the task.

PETRIFY SOIL WITH CHEMICALS

Solidifying or petrifying the ground is made possible by a chemical process evolved by a European scientist. Compounds containing quartzlike materials are injected into the soil in quantities that accomplish the solidification in a few minutes. The process is based on the fact that, in nature, the combination of salts and acids present in the soil in the course of about a thousand years convert it into sandstone. The apparatus necessary is simple, and the treatment is cheap.

AUTO TOW BLOCK WITH SPRING HELPS RELIEVE STRAIN

Compact and always ready for service, an auto-towing tackle is fitted with a spring which takes up the strain at the start, and a steel cable is contained in a reel, eliminating the usual bothersome length of rope. The flanges of the block are grooved so that it may be used as a purchase block in obtaining extra leverage, when the car is stuck too firmly to be dislodged by a straight pull.



Close View of the Automobile Tow Block, and Illustration of Its Use in Connection with a Stump

TALKING PICTURES ARE SENT BY LIGHT BEAMS



Girl Seated before Apparatus Which Transmits Her Voice and Picture on a Ray of Light

Beams of light in the form of violet rays, instead of radio waves, have been used successfully in transmitting a talking picture. The demonstration was made with a beam about sixty feet long, but it was said the violet rays can carry the picture as far as twenty-five miles. The apparatus used was of the scanning-disk type, but instead of converting the light into electric impulses to be turned into radio waves, the machine reduces the light to violet rays. An apparently steady beam of light spanning the sixty feet to the receiving set was in reality flickering 15,000 times a second. Photo-electric cells on the receiving set converted the flickers into electric impulses which in turn operated a neon-light tube before the receiving disk. Violet-ray transmission is as good at night as in the daytime, and even penetrates fog, it was explained, but to transmit to homes, everyone would need a photo-electric cell with a filter admitting only violet rays from the sending station.

2978
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The Army's Flying



Lieut. F. B. Tyndall, Rear, Studies His Maps, While Lieut. Edmund C. Langmead Takes His Compass Bearings

THREE airplanes circled low in the midst of a fog that overhung Bolling field, Washington, the other day, and then, after a few graceful maneuvers, taxied, one after another, through the mud toward the hangars.

Their landing did not cause particular interest until one of the field's mechanics, getting ready to direct the ships into the adjoining sheds, happened to glance inside one of them—a standard tri-motored Fokker transport.

With an exclamation of surprise he beckoned to one of six youthful flyers, who, just having jumped out of the planes,

were now undoing their parachutes. "Say, Lieutenant, what are all them curious-looking doodads in there? All that radio and navigation stuff?"

"They're part of our flying class room," was the reply.

Lieut. Edmund C. Langmead went on to explain that this particular ship was the very latest training innovation introduced by officials of the army air corps in their efforts to develop the highest type of student flyer. Many novel engineering changes were made on the ship in accordance with the purpose of sending the students, toward the end of their flight training, on long navigation trips, the idea being to let each one individually put into practice the theories taught him in the ground class.

The novel training course began last January at Wright field, Dayton, Ohio, under the direction of Capt. Clyde F. Finter, Lieut. Albert F. Hegenberger and Bradley Jones. Lieutenant Hegenberger is

noted for the many flights he has accomplished mainly by virtue of expert navigation knowledge, particularly the one with Lieut. Lester J. Maitland, from Oakland, Calif., to Honolulu, Hawaii, in June, 1927. Captain Finter and Mr. Jones have devoted many years of study to astronomical methods of navigating planes.

Under present plans, the course is four months long and the class consists of six students. Besides Lieutenant Langmead, the original sextet are Lieuts. Phillips Melville, Edmund C. Lynch, Guy H. Gale, Frank B. Tyndall and Francis B. Valentine. All these flyers have made what is

Class Room



Through the Trapdoor on Top of the Navigation Ship's Forward Cockpit, the Observer Can Rise with His Instruments to Take the Plane's Bearings

agreed to be the longest training flight in the history of air corps instruction. Spending approximately three weeks altogether, the students and their instructors, taking turns at flying the "Flying Class Room" and two other ships that accompanied them—one a tri-motored transport plane and the other an O-11 observation plane—covered virtually all of the so-called southern flying route. In other words, they flew from Wright field into St. Louis, Oklahoma, Texas, New Orleans, Florida, South Carolina, Alabama, Virginia, and the District of Columbia. Captain Finter was in command of the flight while Lieutenant Hegenberger was chief pilot of the "Flying Class Room."

Under the general heading of navigation—the flight's avowed purpose—come what the experts refer to as all types of astronomical, dead reckoning and radio "avigation." Included in this list of somewhat technical-sounding objectives was training the pilot to fly mainly by means

of navigation instruments in case of bad-weather emergencies, like fog, cloudy, stormy or unusually dark skies. Under such adverse conditions, it was explained to the students, they would, of course, frequently be unable to check their courses by means of landmarks and map studies.

The "Flying Class Room's" equipment fills virtually the entire interior of the transport. In the pilot's cockpit, for instance, the standard lower walls were replaced with triplex glass on both right and left sides, so as to afford fullest ground and landing vision. Above, the leading edge of the wing has been cut out to form an observer's cockpit for use in practice with the sextant. This revolutionary change in turn necessitated a change in the cockpit covering.

Using the forward upper point of the windshield as a fixed point, a roof of celluloid, braced by brass tubing, runs to the top of the wing spar. Immediately over the cockpits of the pilot and assistant pilot



able curtain has been hung, completely covering the left, or pilot's, side of the cockpit. In emergency cases, this curtain can be dropped to the rear and bottom of the cockpit by the mere pulling of a rip cord. The pilot's seat has a false bottom of two inches, to raise him higher in the cockpit and thus increase his field of vision.

All seats, baggage racks and usual furnishings have been removed from the cabin. The first bay is for the use of the navigator only. Certain structural members have been relocated and a ladder installed, to permit easy access to the observer's high seat in the wing's leading edge. This is a movable stool which may be swung out of the way when not in use.

In the cabin's floor, a slot, about eight by thir-

are two glass doors opening outward for use as an emergency exit. Above the observer's cockpit is also a glass door, which, when in the open position, serves as a windshield to the observer while he is making sextant readings; while set in each side of this cockpit, above the leading edge of the wing, is a square of flat, optical glass to enable the observer to take lateral horizon sights.

Even the gasoline-control installations have been moved. Usually they are directly to the rear of the pilot, but now they are on the extreme right side. An induction-compass controller has been installed to the left, very convenient for use of the pilots in communicating with the navigator or the students in the cabin.

For the purpose of instruction in blind flying, a quickly detach-



Top, Studying the Plane's Radio Set; Note the Special Braces and Supports for the Equipment; Below, Taking Sight from the After Cockpit of the Plane; the Process Is Essentially the Same as That Used at Sea



Interior of the Training Plane's Cabin Showing the Radio Equipment at the Rear Used by the Traveling Students in Communicating with Landing Fields

ty-six inches, covered with plate glass, has been cut for use in making drift readings; a drift meter has been placed at the front end of the slot, and another type of drift indicator at the rear end. Between these instruments is a stand, upon which a compass is mounted that serves to check the accuracy of the smaller compass devices.

Adjustable seats are installed in connection with the drift indicators, and the radio operator likewise has such a seat, besides a swinging table. Complete radio sending and receiving sets are installed, for which a 1,000-volt generator, on the right outboard engine, furnishes power.

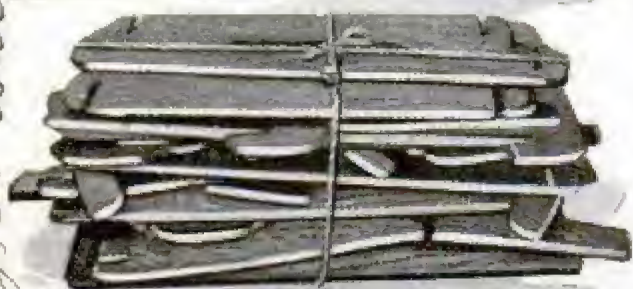
The rear, or baggage, compartment has also been altered materially. The door usually serving as the passenger entrance to this section has been removed and the opening closed with fabric. The usual baggage door serves both as an exit and an entrance, and the roof of this compartment is a round opening provided with a quickly removable glass cover and windshield, furnishing a second region for ac-

curate taking of sextant readings. Beneath this opening is an adjustable seat that may be raised or lowered to suit the needs of the navigator.

The original students in this new navigation course have expressed themselves as highly pleased with the benefits it offered them, notably in connection with the practical first-hand utilization of almost every kind of modern navigation instrument. During the recent cross-country flight, the flyers plotted their location at various times by means of their instruments and checked the results with the pilot. At first, they met with indifferent success, but toward the latter part of the flight, their errors rapidly became less important, approaching the perfect stage.

¶The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished by addressing the bureau.

MODEL FURNITURE OF PLYWOOD FITS WITHOUT GLUING



Children Assembling Furniture, and a Package Showing the Compact Form of the Pieces

Plywood furniture for the nursery, so strong that it will hold the weight of adults, is quickly fashioned from flat pieces designed by a western manufacturer. No screws, nails or glue are necessary, as the parts are tightly fitted together by interlocking parts. With a little practice, children can learn to assemble their own furniture and take it apart for packing.

TOY EXCHANGE LETS CHILDREN BORROW PLAYTHINGS

Boys and girls who tire of their toys may take them to a toy exchange and turn them in for other playthings more to their liking, under a system worked out by the playground association of Philadelphia for its recreation centers. The exchange operates along lines similar to the circulating library, toys being gathered at the playgrounds and the children selecting the playthings they like best and using them to their heart's content. When the novelty wears off, they return them and select something else. Many of the toys are donated by children having an overabundance of playthings. A scarcity of dolls has proved to be the biggest trouble.

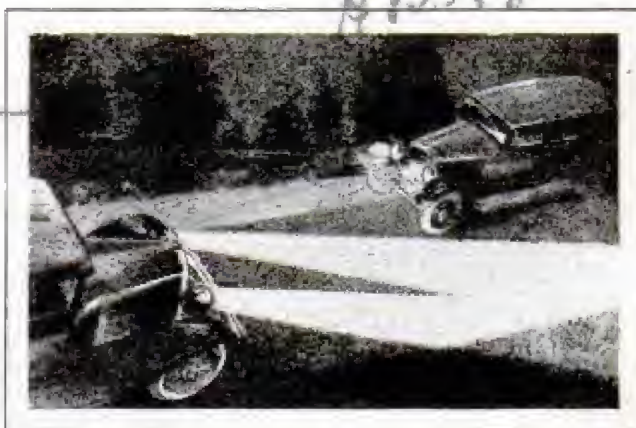
Regardless of how old a doll may be or how many other playthings a little girl possesses, she usually is unwilling to part with even one of her "children."

U. S. BIRDS FIND VENEZUELA IS WINTER RESORT

Venezuela is the favorite winter resort of feathered North American tourists seeking warmer climes, an expedition sent there to study bird life by the National Geographic society has found. Although in the tropics, the varying elevations offer a variety of climates, many of which are comparable to those found in the United States, but the birds usually seek the warmer, sunnier regions. Among North American birds that sojourn in the country are redstarts, blackpoll, various kinds of warblers, summer tanagers and grosbeaks. They particularly like the coffee plantations where they are kept busy devouring insects.

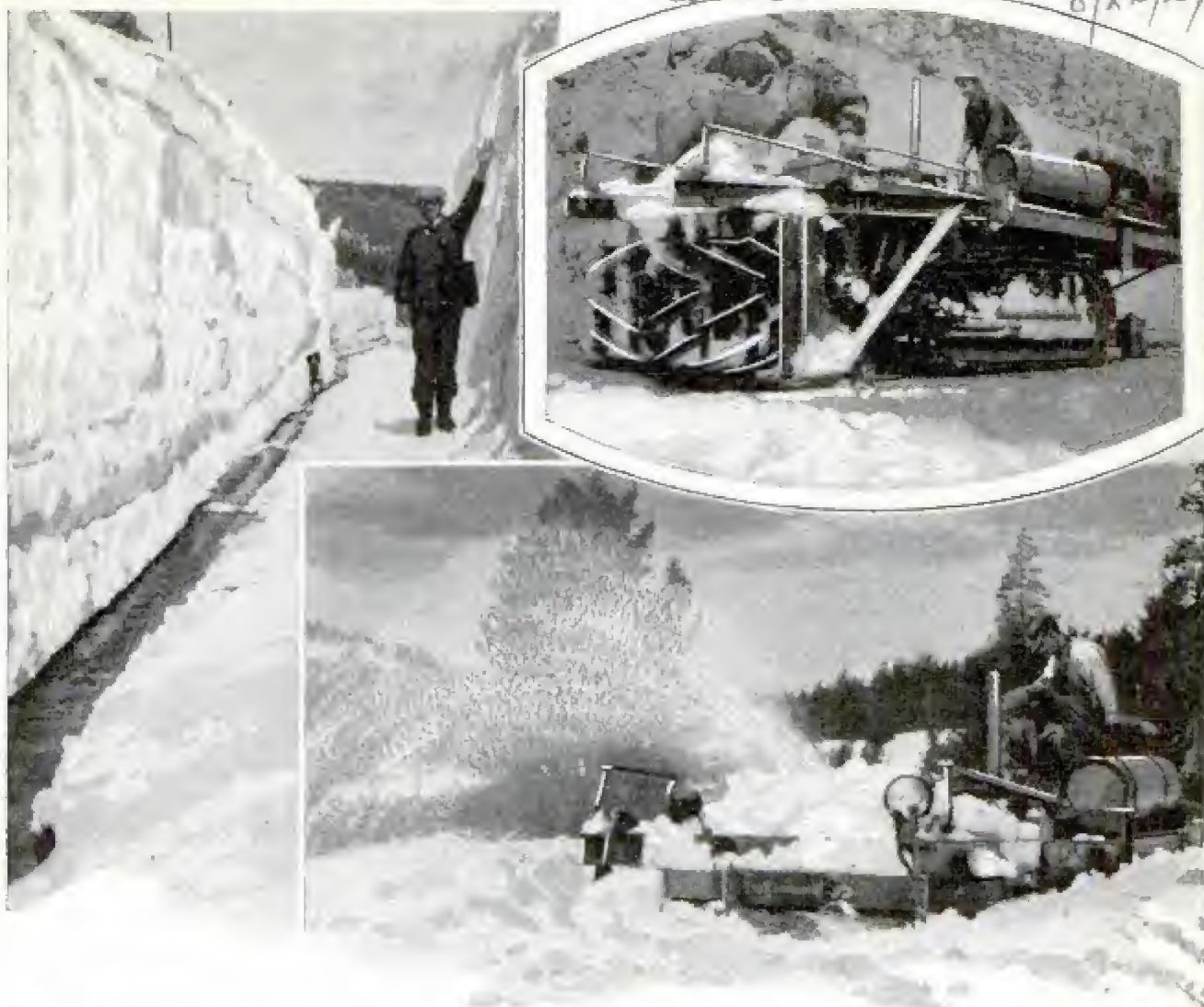
LIGHTS TURNED BY DASH KNOB FOR SAFER DRIVING

Night driving has been made safer by an automobile-headlight control, operated from the dash of the car, which diverts the rays of the lamps when another car approaches without the necessity of dimming. The control changes the direction of the lights from the center of the road to the right side, thus eliminating the blinding glare without cutting down the intensity of illumination and throwing into relief the side of the road along which the car is proceeding. It is operated by pulling a knob on the cowl.



Pulling a Knob on the Dash Diverts Auto Headlights to Right Side, Thus Avoiding Dimming

Can not locate 8/24/29



Rotary Snowplow Keeps Mountain Roads Clear; Left, a Road Freed of Snow; Upper Right, the Plow, Showing Large Blades, and, Below, the Machine Bucking a Drift

ROTARY SNOWPLOWS TO KEEP MOUNTAIN PASSES OPEN

Designed to attack huge snowdrifts and keep mountain passes clear of snow, a rotary plow is powered with an endless-tread tractor and equipped with three rotary wheels or blades. Two vertical front blades are barrel-shaped and intended to cut and draw the snow into a center blade which deposits it to either side of the road as desired.

GASOLINE FLOW THIN AS A HAIR MAKES AUTOMOBILE GO

Figuring the efficiency of the modern automobile in terms of the stream of gasoline necessary to make it go, it has been estimated that a constant flow of fuel of little greater diameter than that of a hair would furnish all the power necessary to

operate a car. The fuel consumption of an efficient locomotive is so small that, if it could take on its coal as it went along in the form of a solid bar, the bar would be no larger in diameter than an ordinary lead pencil.

ROD CUTTER FITTED ON VISE 283 / SAVES TIME

Easily attached to the vise or to the workbench, a combination cutter has been introduced for the shop. It is useful in cutting drill rod, preparing templates or cutting sheet metal into any shape at a great saving of time. It is also adaptable for inside or outside nibbling.



*W. A. Schaefer
45 Academy St.*

*Highway Machine
Co. 10. Kacze*



The LATEST in

disk revolves in front of the lamp, and from it is projected the image, which is seen in the viewing frame.

Jenkins' transmitters, past and present, differ from others in that he employs a quartz-rod drum in place of the scanning disk. Thereby, he claims to get far better sharpness and detail of image. Particularly is this true in the case of the new transmitter, revolved by two powerful synchronous motors instead of one, and fully capable, tests have proved conclusively, of broadcasting halftones as well as the familiar silhouettes.

A short time ago, Jenkins started using his new transmitter, broadcasting from his recently completed laboratory near Washington, and, as many amateurs now know, he is transmitting movies every night, instead of only thrice a week. And, most important of all, he occasionally broadcasts in halftones, since the radio commission has lately granted him a suitable short wavelength for the purpose.

No one ever knows what Jenkins has up his sleeve for tomorrow, but today he's having a lot of fun experimenting with two other television devices recently invented: the first, a receiving apparatus for radio movies in the theater, and the other an "aerial television eye," designed to transmit airplane views of cities to a ground receiving station.

"ADJUST that synchronizing knob, my boy, and then beat it out of here. You've earned a rest," said a fatherly voice to a young research worker in a Washington laboratory the other day.

As the young fellow passed through the door, the older man, alone in one of the most famous workshops in the country, chuckled to himself: "Well, now, I guess that device will be well able to send out movies that in line and detail aren't so much inferior to the ones we see regularly at the corner theater."

The newest transmitter of C. Francis Jenkins is outstanding among the astonishing television developments of the past few months. As most every one knows, the average popular system of television today consists of a scanning disk that contains a series of holes arranged spirally and revolved by a synchronous motor in front of the image to be transmitted. As the disk rapidly revolves, the holes cut images into many sections and these affect a photo-electric cell, which is so arranged as to transmit a radio signal. At the receiving end these signals affect a neon lamp, the light of which varies directly with the current that operates it. A similar



Some of the Famous

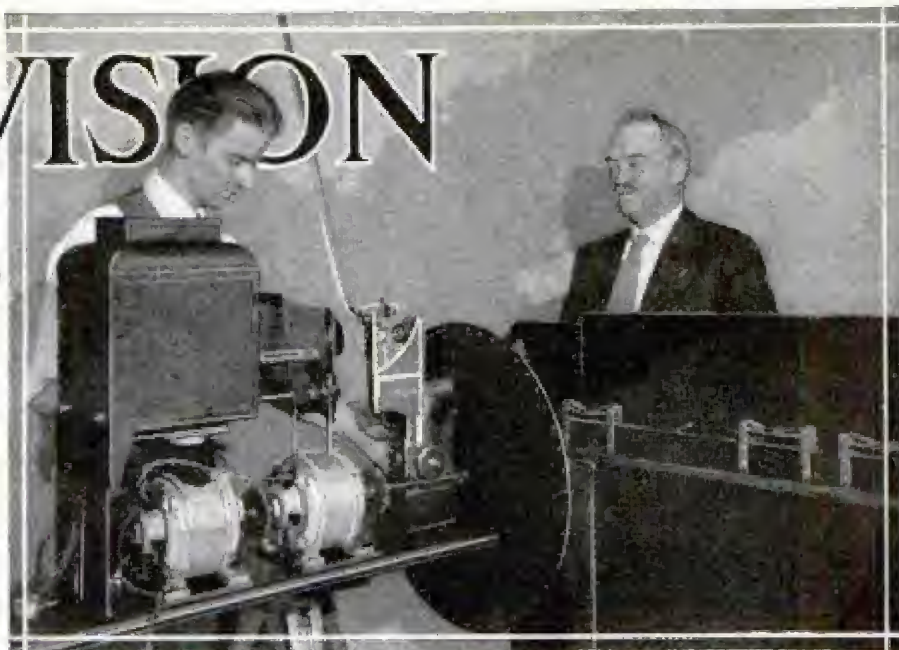
TELEVISION

by
James N. Miller

as his other receivers with certain technical differences. The area on which the picture is shown consists of forty-eight horizontal rows of flashlight lamps, with forty-eight lamps in each row. They are arranged in a like number of holes in a two-foot-square plate,

supported in a vertical position. The lamps are divided electrically into four banks, and each is individually wired to its particular contact of the switching gear. When the motor is started, the incoming amplified radio signals are distributed to the several lamps in succession, fully lighting some of them, lighting others to partial brilliancy and leaving others unlighted. The result is a picture built up in lights and halftone and shadow on the face of the plate.

The picture is made up of glowing lamp filaments which persist, in light value, for an appreciable time, say a tenth of a second. But as the exciting impulse is applied every fifteenth of a second, the lamp is aglow for the whole time the corresponding area of the scene at the transmitting station is alight. Which is to say that the whole of the received picture is on the plate all the time instead of only a



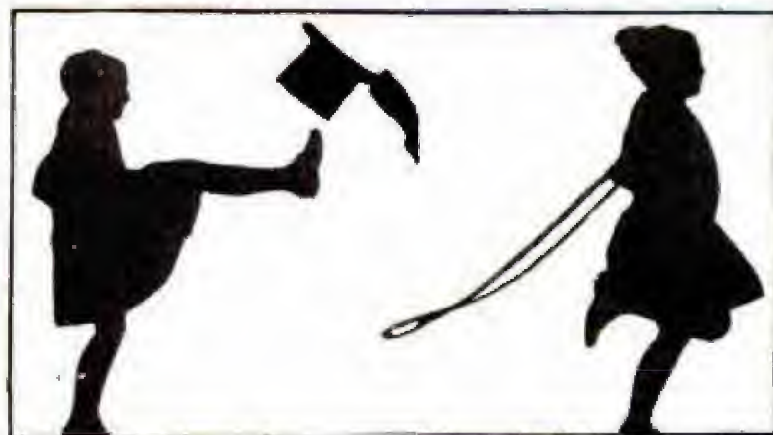
Jenkins' Latest Transmitting Device, Just Completed, Broadcasts Not Only Silhouettes, but Halftones as Well

fractional part of it. In front of the plate a lens is mounted for projecting it onto a theater screen. As the light source is the picture itself, the only loss is that resulting from the magnification. And, fortunately for the observer, the light is white, not the pink color characteristic of the neon lamp.

The aerial television eye is being tested in the inventor's new Curtiss plane. Army and navy officials have manifested keen interest in the invention, since it would have great military value in time of war. With its use, an army's general headquarters would be put within sight range of front-line operations. Constructed to insure refinement of visual detail, the device enables the panorama below to be recorded in the usual way by means of a large scanning disk, light-sensitive cell and other broadcasting paraphernalia. The scenes are received on regular tele-

vision machines set up in the Jenkins laboratories. The scanning eye focuses on the ground through an aperture in the bottom of the ship. The inventor, an experienced flyer, directs all maneuvers and pilots the plane while two assistants operate the television machinery.

Mr. Jenkins says: "We are repeatedly told that it will be from five to ten years before the public will have perfect television receivers. One might just as truth-



Jenkins Shadowgraphs



fully say a thousand years, for perfection is never attained. Fortunately for the inventor, the improver and the research man are never satisfied.

"However, the new industry is progressing by leaps and bounds. True, it is still wrapped in swaddling clothes. Nevertheless it should be borne in mind that animated pictures differ from still pictures only in the speed of presentation, and the process of sending the latter by radio is highly perfected.

"We are beginning to take television out of the peephole or one-man state. The problems of increased detail, better illumination and a more precise synchronization of the transmitting and receiving disks are in capable hands, and I regard their solution as a matter of a short time only."

Judging from the queries that come regularly to his laboratory, Mr. Jenkins says, there must be over 20,000 amateurs regularly receiving his movies. Official figures now available tell an even more surprising story. While they do not divide television into its still and movie chapters, they show that twenty-two visual broadcast stations, probably, by the time this is read, will be transmitting pictures and television images on channels assigned

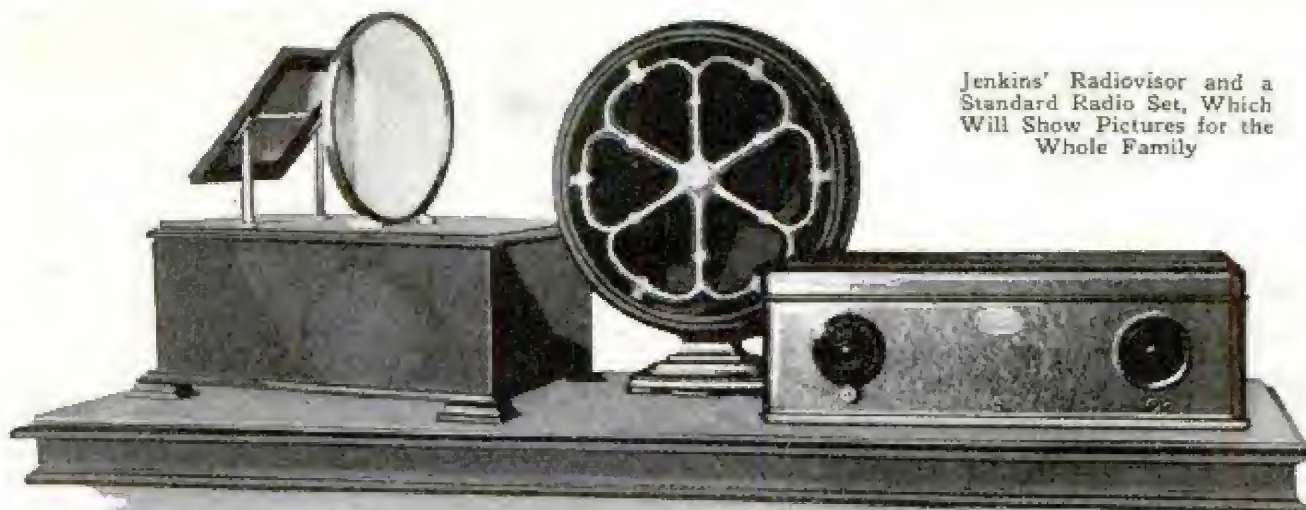
by the radio commission. Moreover, the broadcasting now is on a nationwide basis, for twelve of the stations are in the east, four in the middle west, two in the far west and one in the south. Jenkins himself, from station W3XK, at Washington, (and his new station has the same number) has been using two channels simultaneously—the short-wave band



Taking a Movie in the Jenkins Laboratory: Already Television Has Reached the Stage Where the Whole Family Can Enjoy It

for long distance "lookers-in" and a regular broadcast channel for the enthusiasts at Washington and vicinity.

"We now are in a position to provide any number of scattered, independent broadcasters with facilities for inaugurating a television service," he says. "It is the first practical step which has been taken in the direction of a national distribution of television programs. Often I have been asked why I haven't always been broadcasting halftone movies, showing details of scenery and persons, instead of silhouettes or movies in black and white only. My answer is that the halftones, in regular movie film and in broadcasts from living subjects, require a broader band. However, bands 100 kilocycles wide have just been assigned by the radio commission for such work, so I shall gradually increase my output of halftone films, and soon expect to be broadcasting, for fire-



Jenkins' Radiovisor and a Standard Radio Set, Which Will Show Pictures for the Whole Family

side entertainment, pictures selected from those now shown in the theaters.

"The present halftone broadcasts are received in the nation's televisors just as easily as are the silhouettes. My present system of transmitting was undertaken principally to enlist the co-operation of the amateurs in order to learn the possibilities and the limitations of this new entertainment; and to build up a perfect

tion pictures to the theaters by means of radio instead of by film."

May we expect home talking movies shortly, and, if so, about how soon, the inventor was asked. "Probably within a couple of years," he replied. "Dr. De Forest's perfected high-vacuum tube is going to be the foundation of transmitted sound motion pictures, just as it is now the foundation of sound broadcasting. It is the

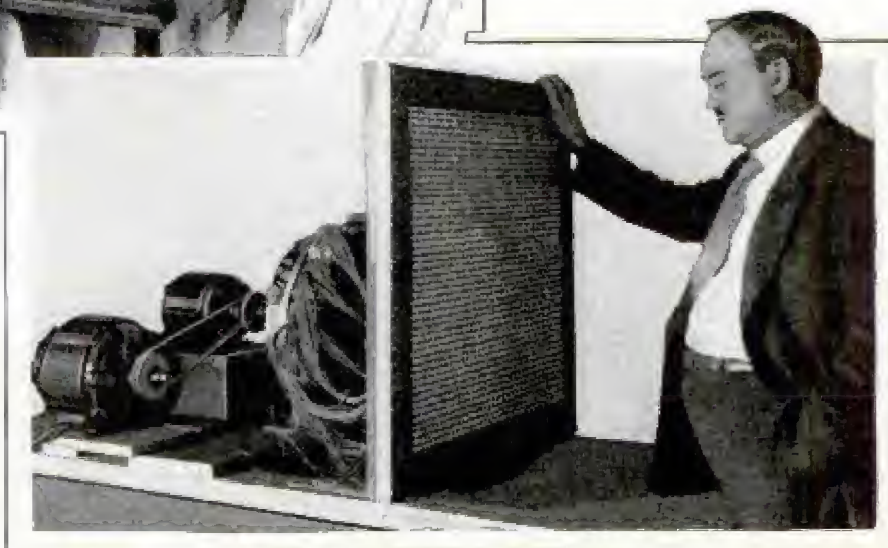
Aladdin's lamp which will enable vast audiences to see as well as hear through space."

Answering another question, Mr. Jenkins declared: "The chances are that the sight channels of radio communication will never seriously interfere with the proper reception



radio-movie technique.

"When I've picked up more valuable information in this connection and have perfected my new motion-picture theater receiver, I'll be able to play ball with some degree of efficiency with vast audiences of lookers-in; and then I can likewise help the producer to distribute mo-



The Small Silhouette Above and the Two-Foot-Square Image of the Latest Receiver, Below, Illustrate the Strides Television Is Making

of sound. Nor will the reverse situation obtain. One day the radio fan, because of the new short wavelengths designated for television, will be able to watch the radio folks dance and sing while he likewise tunes in on the longer wavelengths for his sounds. The result should be a well-synchronized entertainment product.

"Television's greatest immediate problem is to produce a simple, practical and fool-proof televiser for the entertainment of the whole family circle. While I have built one that comes fairly close to meeting these requirements, there is still plenty of research work ahead. As for size, I lately have succeeded in magnifying the television image to a point where it can be viewed by as many as a dozen persons at one time.

"When radio service to the eye shall have a comparable development with radio service to the ear, the new era will bring to the fireside a fascinating teacher and entertainer without limitation of language, literacy or age."

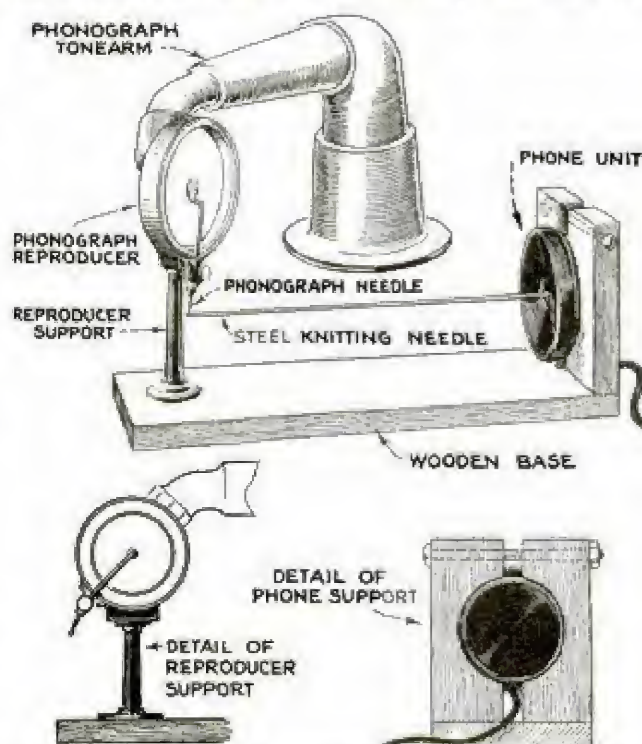
Correcting an A-Eliminator Trouble

A number of really good A-battery eliminators are now available for receivers formerly operated with a storage A-battery. All the good characteristics of the d.c. tubes, together with the advantage of full a.c. operation from the house lighting when the A-eliminator is used in combination with a B-eliminator, make this method of powering the set very desirable. There is one slight disadvantage, noticeable in some localities, which, however, may be easily remedied. Distant stations will be coming in about as usual, but powerful local stations may fade in and out in a puzzling manner. Most sets employ-

ing d.c. tubes have a volume control in the form of a filament rheostat in one or more of the r.f. stages for decreasing volume when desired. This is a rather critical filament adjustment, and when an A-battery eliminator is used instead of a storage battery, the slight fluctuations in the line may be reflected in the output of the set. To remedy this condition, a volume control of a different type should be installed, by connecting a potentiometer across the antenna and ground posts of the set, and the center tap of the potentiometer to the antenna lead-in wire. The former volume control, or controls, may now be left in the full-volume position, and the volume controlled with the potentiometer without disturbing the filament balance of the tubes. In this way, the slider of the potentiometer enables any desired part of the signal voltage to be impressed on the grid of the antenna-coupling tube.

Using Phonograph Horn as Loud Speaker

The horn employed in a good phonograph makes an ideal radio speaker when no other speaker is available. The diagram shows a simple method of connecting the phonograph tonearm to the output of the radio set. The apparatus may be quickly attached or detached by simply backing off the setscrew that holds the phonograph needle in position. A steel knitting needle is soldered to the center of the phone diaphragm and to the point of the phonograph needle, and mounted as shown. A support of wood or metal is built up under the reproducer, so that the needle is held horizontally. The reproducer rests on sponge rubber. The vibrations pass through the knitting needle to the phonograph needle and the sound issues from the horn.



Phonograph Tonearm Connected to Headphone Unit, and Details of Both Supports

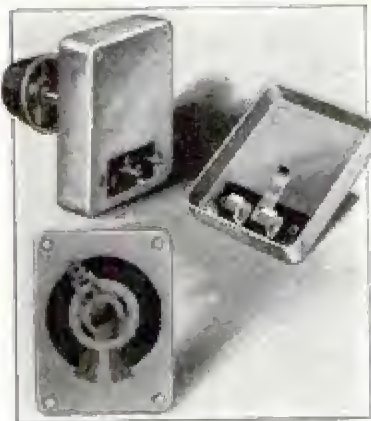
Soldering Tips on Tinsel Cord

Headphone and loud-speaker tips break off after considerable use and render the connection useless. They can be resoldered, but this must be done carefully, because the circuit is through tinsel and not wire and the former will quickly melt under heat. The proper way is as follows and is the method used in factories for applying the tips: Push back the insulation from the tinsel about 1 in. and wind on a piece of fine copper wire spirally over the tinsel. Then clean out the tip by melting away the solder and drop in a fresh bit of solder. Place the wire-wound tinsel end in the tip and then heat the tip sufficiently to just melt the solder inside. This immediately surrounds the tinsel and wire and, upon cooling, a firm connection is made.

2318 R

Volume Control Handles High Currents

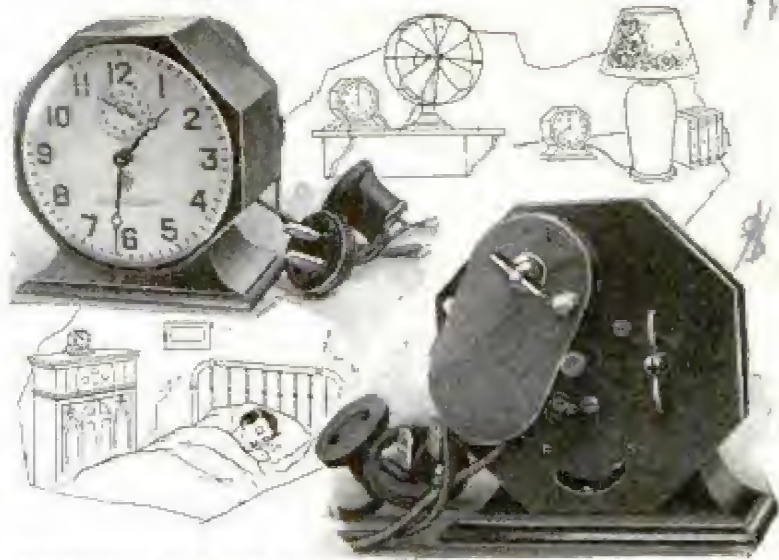
The high currents employed in modern radio receivers demand a volume control of great capacity. The unit shown in the illustration is made chiefly of metal and handles the current with ease, safely dissipating five watts. The application of the resistance element and the



contact design are said to be thoroughly efficient. A special graphite paint is fused to an enameled-metal base so effectively that there was no perceptible wear and no appreciable change in resistance value after a test of 65,000 turns of the contact arm at lower left. Photos show the complete unit and the interior construction.

Popular Mechanics' radio department offers its information service free to all readers of our magazine. We will be glad to help you with your problems, and will promptly answer all inquiries.

Electrad. Inc.
1935 Janice



Automatic Clock Set to Control the Operation of a Lamp and Fan, and, Below, to Start the Radio Set for Morning Exercises

A Radio Self-Starter

The little clock shown in the illustration will perform various kinds of work. It can be set to turn the electric radio set on or off at any predetermined time. It will also control the operation of an electric fan, heating pad or lamp. A cord and plug are provided for the wall socket, and an outlet socket in this line is employed to take the plug from the electrical device to be controlled. The rear view shows the switching control "off." If this tab is pushed in, the word "on" appears. The clock is set for the time of operation in the same manner as an alarm clock, and it is necessary to wind the key for each setting.

Polarizer for Electrostatic Speakers 2340 R

The small unit shown in the photo furnishes the necessary 600 volts for the operation of the new "electrostatic," or condenser-type, speakers. This high-voltage unit is necessary to charge the surfaces of the speaker and is known as a polarizer. It consists of a small transformer, a blocking condenser and a rectifying tube. The latter delivers 3 to 4 millamp., which suffices to charge the speaker.



National Company, Inc.
61 Sherman



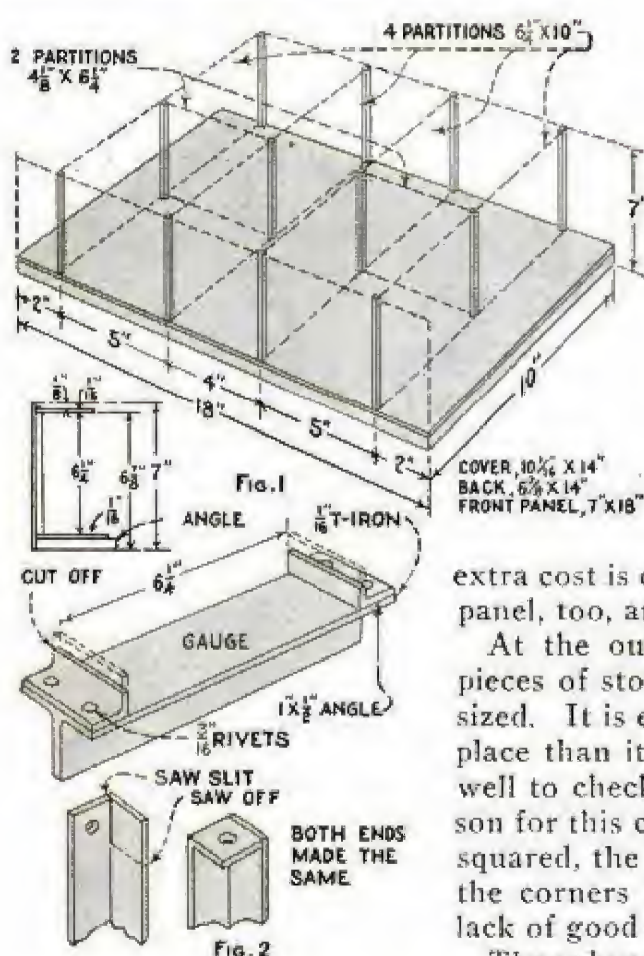
All-Metal Cabinet

WITH every part of the set inclosed in a completely shielded compartment of its own, the interfering magnetic fields are as completely removed as it is possible to do. Furthermore, this shielding prevents the wiring, coils and other parts from serving as auxiliaries to the antenna, and thus selectivity is an additional product of thorough magnetic insulation.

With the exception of the front panel, this cabinet is built of sheet brass, the stock being approximately $\frac{1}{16}$ in. thick. The subpanel should be at least of this gauge, but the cover, back and partitions may be somewhat lighter. However, for rigidity and general all-around results the heavier metal is to be preferred.

The cabinet, complete, will cost from \$6 to \$8, seemingly a rather high price, but if the four stage shields that would otherwise be required, are bought at a minimum of \$1.50 each, which is a low estimate, the extra cost is only \$1 or \$2; you have a metal panel and subpanel, too, and the outfit is complete and in a single unit.

At the outset, the importance of having the various pieces of stock square on all sides cannot be overemphasized. It is easier to have the stock cut square in the first place than it is to file it down later on, and it is just as well to check up before you start working. Another reason for this caution is that, unless all pieces are accurately squared, the finished job will be more or less out of line, the corners won't fit and, finally, the work will exhibit lack of good workmanship.



The subpanel, where the work will start, is a 10 by 18-in. sheet of brass, supported on all four sides by strips of brass angle, which are mitered at the corners and attached to the top with round-head machine screws in threaded holes. There is not a nut used in the complete assembly for the reason that it is easier to run the screws into threaded holes than it is to fumble with nuts, and besides, the job stays tight. All holes are drilled with a No. 35 drill and tapped with a 6-32 tap.

Holding the angle strips to the base with clamps, holes are drilled along a line scribed $\frac{1}{4}$ in. inside the edge. If the finished job shows gaps at the corners or if a bit of additional strength is needed, solder may be used and dressed down later. The top is now removed and any burrs that may result from the drilling and tapping operations are filed off flush. This is important to remember as you go along with the work. It might also be well, while you're at it, to fasten a short piece of angle, say about 1 in. long, to the middle of the underside, in order to minimize any tendency of the subpanel to sag

is Easy To Make

by J.S. Hagens

under the weight of the parts placed on it. After the subpanel has been completed, the next thing is to saw off 12 pieces of brass angle, no less than 7 in. long, and better $\frac{1}{4}$ or $\frac{1}{2}$ in. longer. These 12 pieces will form the supports to which the partitions, top and rear cover, and front panel will be attached. Fig. 1 shows how this should be done. The supports should be made $6\frac{1}{4}$ in. over all. If additional cabinets of this type are contemplated, a gauge of the type shown will be found a convenience later.

When bending the ends over at right angles, to form the top and bottom of the supports, as shown in Fig. 2, make allowance for the thickness of the metal. In other words, the bend is made not on the scribed line, but slightly short of it, the difference depending on the thickness of the stock, but in general this will be approximately $\frac{1}{16}$ in. After the lugs have been turned over in the vise, the bend can be beaten down with a hammer in order to make it as nearly square as possible. The upper end of each support is drilled and tapped, but the lower end is drilled with a $\frac{3}{16}$ -in. drill, the subpanel being tapped for the screw. The $\frac{3}{16}$ -in. holes allow a little play around the screws, so that the uprights may be shifted slightly to aline them when assembling.

The next step is to scribe a line $\frac{1}{4}$ in. inside the edge of each individual partition piece, on one side only, this line marking the position of the holes for the screws. A carpenter's marking gauge is the best tool for this purpose. Next lay out the position of the various partitions on the subpanel, using a scribe and square. In doing this, allow for the thickness of the partitions and scribe two lines, one, the outside line, to show the over-all dimension, and the inside line to show the thickness of the metal. It is along this latter line that the perpendicular supports are located.

As an example of the foregoing, if only the dimension line is shown and the supports located along it, then the finished job will be wrong at the end "ledges," which, instead of being 2 in. wide, will only be $1\frac{1}{16}$ in., the difference representing the thickness of the metal at each end. Set the partitions inside the dimension lines. The interiors of the compartments will be made that much smaller, of course, but your dimensions will come out as you have planned them.

There now remains only the squaring up of the supports with their partitions, holding them securely with clamps while the holes for fastening the partitions to the supports are being drilled and tapped.

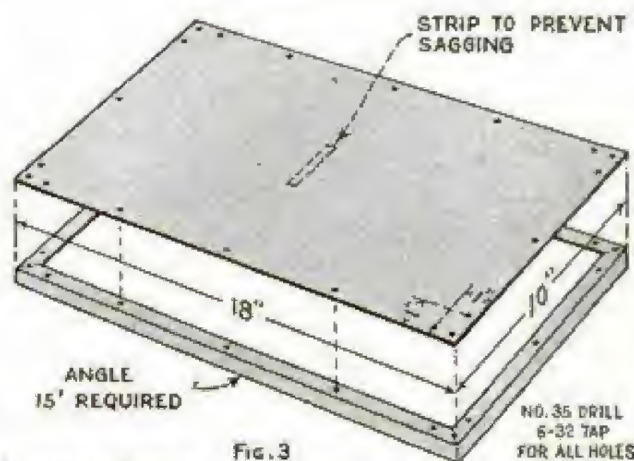


Fig. 3



The front panel is made of satin-finished aluminum. If you cannot buy such an article, get the bright finish, and "dull" it



Shielded Cabinet Nearing Completion; the Compartment-Arrangement May Be Altered to Accommodate a Variety of Circuits

with a wire scratch brush on a grinding arbor if available, taking care that the scratching is done in one direction only. This method can also be used for giving the completed job a final touch of good workmanship.

The cabinet illustrated was made for a particular job, and, of course, for different circuits some changes may be necessary, although the method is always the same. For example, the angle frame below the subpanel was $\frac{1}{2}$ in. in this case, but if condensers are to be placed under the subpanel, it will be necessary to use $\frac{3}{4}$ -in. angle in order to get sufficient height underneath and to change the length of the uprights. Such alterations should be figured out before the work starts.

Shielding S-G Tube Leads

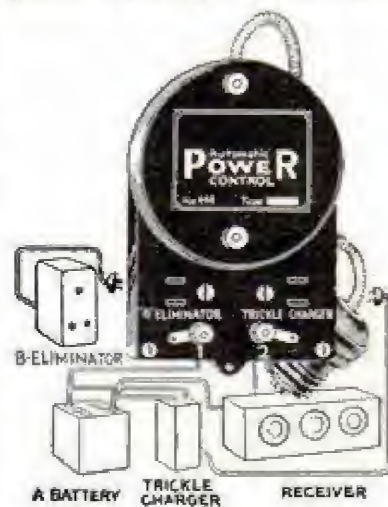
Shielded leads to the grid and plate of the screen-grid tube are recommended; in fact, such shielding, especially for the plate lead, is essential in all circuits employing these tubes. The control grid

lead in some circuits, however, shows a decided tendency to work better without the shield, and the builder should try the tube with and without shielding this lead to the cap. There are a number of ways to shield these leads, but the simplest method is to use the flexible insulated wire, covered with a woven metal sheath, now available for this purpose. Care must be taken when grounding this metal covering, especially on the plate lead. Keep the sheath cut back from each end of the lead, so that it will not come in contact with the terminals. When grounding the metal sheath, pull a bit of the woven metal from the insulation and solder this tip to ground. If the shielded lead passes through a small hole in a stage shield and makes contact on the grounded shield, no further grounding is necessary.

2172. R

Automatic Control for A-Battery Sets

A large number of owners of radio receivers, operated with a storage A-battery, are still throwing a series of complicated switches for the B-eliminator and charger. An automatic switch makes it unnecessary to insert and remove the plug from the light socket and turn several switches every time the set is used. It automatically takes care of the B-eliminator and trickle charger or either. It is available in several types according to the kind and number of tubes in the set, and a similar model of later design is available for use with a 2-ampere tungar charger where a trickle charger is not capable of keeping the battery charged up for the efficient operation of multi-tube sets. The connections are very simple, as the automatic control-switch is merely cut into one side of the A-battery line to the set and plugged into the light supply.



The charger and B-eliminator are plugged into the receptacles provided and the set is controlled by the original switch.

Radio Rec. Corp. Co
A. A. Clinton

Disk Coils for the Experimenter

By EDWARD A. McMURTRY

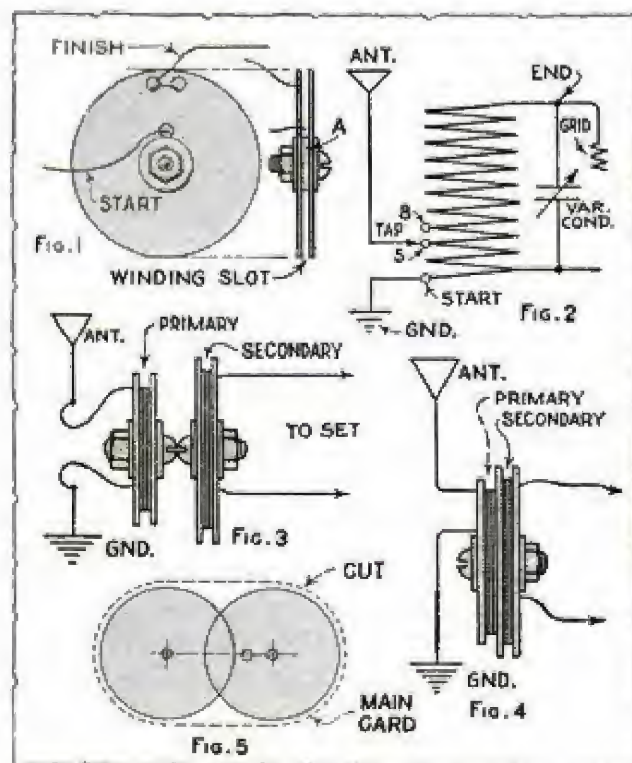
DISK coils have several qualities which will prove of interest to the experimenter and set builder with a limited pocketbook. They are easily made, compact and efficient, the field is restricted and they are adapted to any standard circuit with excellent results. The writer has used these coils in wave traps and in r.f. and regenerative circuits with good uniform results and sharp tuning.

Fundamentally these coils are composed of two disks of insulating material, 2 to 3 in. or more in diameter; a small brass bolt is passed through the center and a spacer between the disks provides the winding space. The terminals are brought out through holes in either or both disks as desired. A fine grade of paper-card stock, $\frac{1}{16}$ in. thick, soaked in paraffin was used by the author and proved as satisfactory as thin hard rubber and fiber disks.

Fig. 1 shows the two disks clamped by a small bolt with the spacing washer $\frac{1}{16}$ in. thick. A 6-32 or 8-32 brass machine screw may be used and thin brass washers are put under the head of the screw and under the nut to prevent damage to the disks. Small dowel stock and short wood screws may be used instead of the ma-

chine screws and spacing washer if the builder desires to eliminate as much metal as possible from the core. Another method of making the forms is to cut the cardboard square, round off the corners and use an eyelet instead of the machine screw or bolt. In this case, an eyelet and spacing washer may be inserted in one or all four corners after the coil is wound and the unit mounted with a bolt and bracket on one corner.

When winding, the starting lead comes through a hole in the disk but the outside lead, after finishing the coil, is drawn through two holes to prevent loosening. The coils are random-wound with No. 26 d.c.c. or s.c. wire; do not wind the coils



tightly as they are strong mechanically and a light tension tends to reduce capacity effects.

Disk coils are not rated by number of turns but by the length of wire wound on a form of given dimensions. Once you

have determined the correct measurements for a coil it can be duplicated very accurately by making up other forms of the same size and length of wire. To determine the proper coil construction for a given purpose, make up several 2-in. and 3-in. disks with $\frac{1}{8}$ -in. winding space between them. Wind 25 to 40 ft. of wire on each and test them in the circuit, adding or taking off turns until the correct length is found for a given size of condenser. Then unwind and measure the wire so that you can duplicate the coil.

The coils referred to so far have been single-winding units as shown in Figs. 1 and 2. When winding the coil for the first tuned unit of, say, a five-tube tuned r.f. set, mark the wire at 5 and 8 ft., and as you wind, bring out small loops through holes in one of the disks at the marked places for antenna taps, Fig. 2. The starting lead goes to the ground, and the rotor of the tuning condenser and the grid of the tube are always connected to the end of the winding and to the other side of the variable condenser. Leads are soldered to the loops and run either to binding posts or to a tapped inductance switch. This coil, without the taps but with the same variable condenser across it, con-

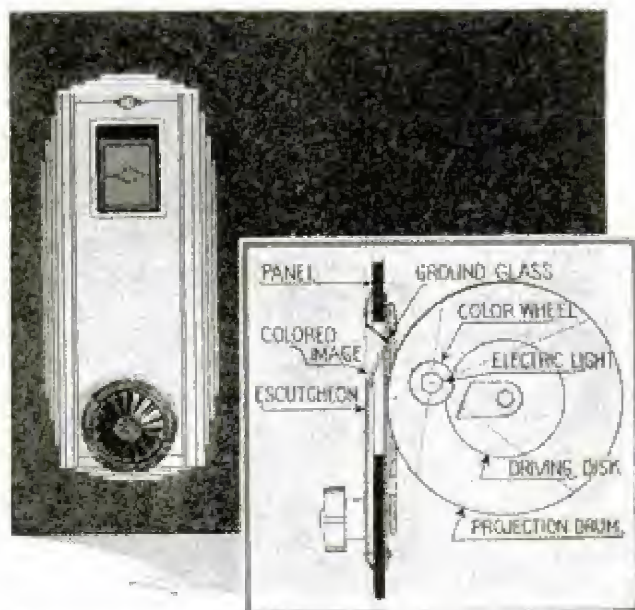
nected to the grid of the tube and the negative-A line, may be used as the secondary and a separate disk coil as a primary. The latter may or may not be tapped as desired and 10 ft. of wire should be wound on it. Place it in inductive relation to the secondary as in Fig. 3. An adjustable bracket may be employed instead of bolting the two coils together so that the distance between the coils may be varied for selectivity.

This is an excellent arrangement for a set of the three-tube type where selectivity in the detector stage is required. However, if several r.f. stages are used as in a five or six-tube set, it is customary to use fixed couplers as in Fig. 4, and similar coils for the other r.f. stages. This coil consists of three disks, $2\frac{1}{2}$ in. in diameter, spaced by two washers, the disk at the primary side being smaller. The spacing washers should be of fiber or other insulating material. The primary winding consists of about 10 ft. of wire and the secondary about 40 ft., both of the same size. It is a simple matter to mark the center of the wire used for the secondary, and bring out a tap for neutralizing a neutrodyne circuit.

(To Be Continued)

New Dial Shows Scale in Colors

A new idea in the construction of dials has recently been introduced by an eastern



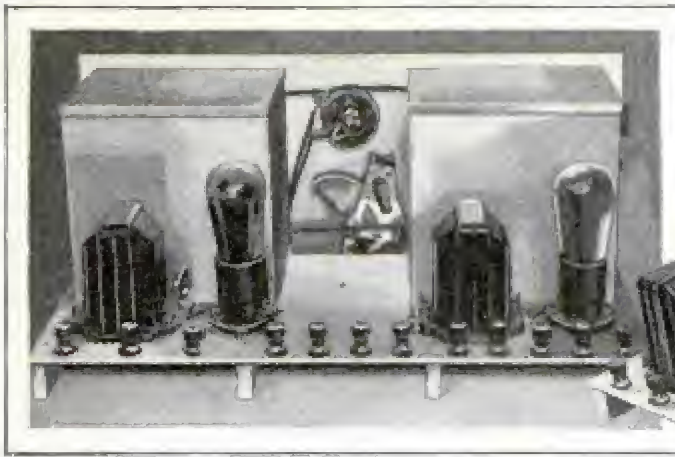
Mounted Escutcheon Plate and, Right, Diagram Showing How the Color Effects Are Obtained

manufacturer. When the set is turned on, the ground-glass front of the dial is illuminated and a single scale number appears. As the dial is turned, figures continue to appear and fade out, accompanied by a play of varicolored lights in the background.

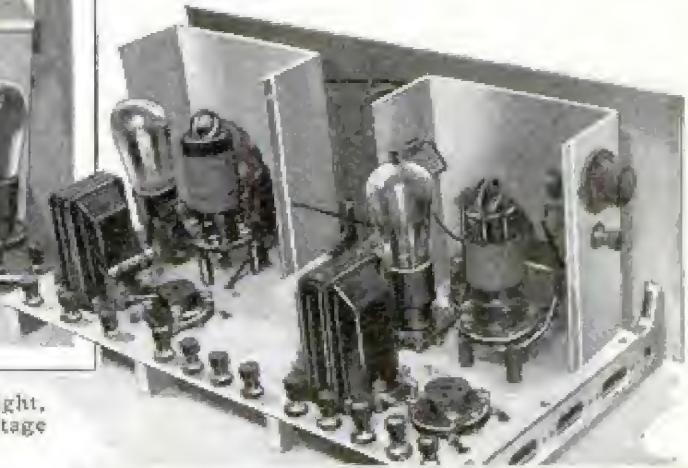
Adjusting C-Bias from B-Eliminator

A variable C-biasing voltage may be obtained from any B-eliminator that has a sufficient number of voltage taps, without making any alterations or additions in the power unit. Simply use the "Neg."-post on the eliminator for negative C; the post marked "Det." for negative B, and "Int." for the detector plate voltage. Now, when the usual detector-voltage control is turned to the left, the C-voltage is increased. To increase the detector voltage, turn the Int. control knob to the right. This simple arrangement has been used successfully by the writer.—Chas. Middleton, Laporte, Ind.

National Co., Inc.
61 W. Main St.



Rear View of Completed Short-Wave Receiver; Right, Rear Section of Shield Cans Removed to Show Stage Assembly; Below, Front Panel



Sectional Shields on Short-Wave Set Facilitate Assembly

The short-wave receiver shown in the illustration is available in kit form and employs a screen-grid tube in a tuned r.f. circuit. The shielded sections are in two parts which are held together with short machine screws when completely assembled. This type of construction makes wiring in close quarters a simple matter. The front panel and subpanel are also of metal and drilled with all the necessary mounting holes for the parts. The range of the receiver may be extended to cover the standard broadcast wavelengths by means of specially designed plug-in coils that fit into convenient receptacles inside the shield cans. The set, however, is particularly designed for the reception of programs from the short-wave broadcasting stations. The receiver is said to be less critical in operation than previous sets of the straight regenerative type because of the increased amplification of the screen-grid tube in the tuned r.f. position.

Keeping Ganged Condensers in Step

The three or four-section ganged condenser will seldom keep the various circuits in step unless some method of balancing is employed. Worn bearings, loose nuts and slightly bent condenser plates will cause an unbalanced condition, preventing selectivity even in the finest sets. The best method is to use small condensers of the neutralizing or balancing type and connect them directly across each condenser in the ganged unit. These



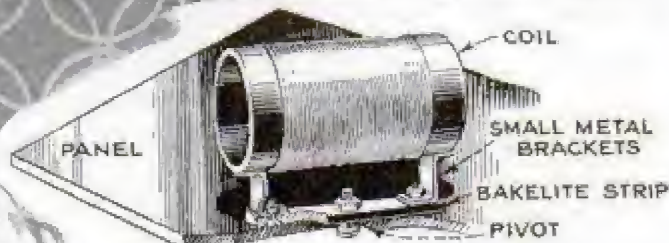
condensers take up very little room, and the capacity may be varied with a wooden "spudger" while the set is in operation. Only one section of the ganged unit may require adjustment, and in this case, the balancing condenser may be tried across one condenser section at a time. Tune in a weak signal about the middle of the dial and vary the balancing condenser. If the signal decreases, remove the small condenser, connect it to the next section, and adjust it until the signal comes in with maximum strength.

Testing Screen-Grid Tubes

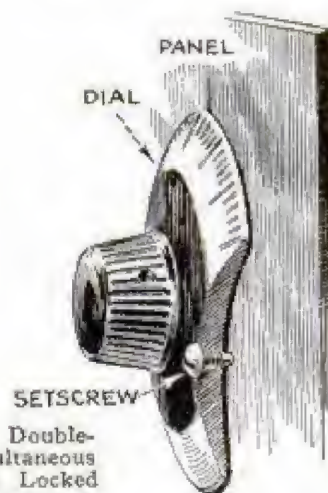
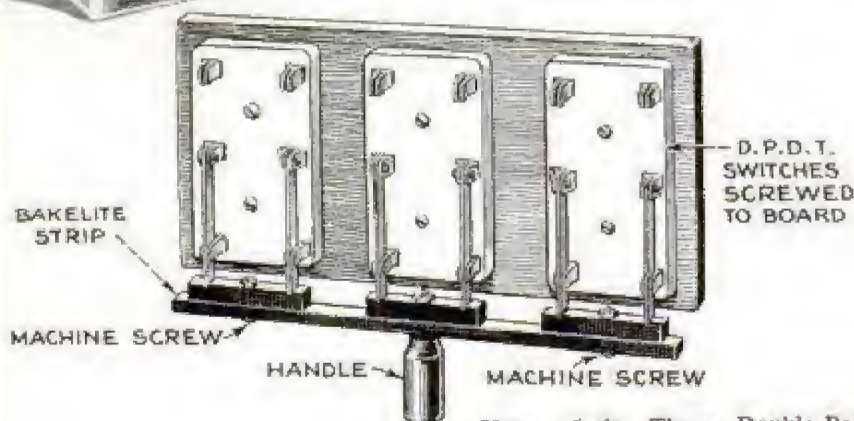
Many of the standard tube testers are not arranged for testing the new screen-grid tubes. This may be done, however, by connecting the grid, screen-grid and plate of the tube and then connecting them to the plate prong on a tube base or adapter. The filament prongs are connected in the usual manner to the tube base or adapter, which is then plugged into the regular tube tester. With 50 volts on the plate and the necessary 3.3 volts on the filament, the plate current on a good tube will show 12 milliamp. or better.

⚠ Never change power-unit connections without first disconnecting the supply.

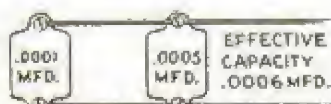
TIPS from the



Left, Standard Aluminum Shield Employed to House a Push-Pull Stage Complete with Tubes, Resistors and By-Pass Condensers; Above, a Simple Method of Mounting Inductance Coils So That They May Be Turned at the Necessary Angle to Prevent Field Coupling



Upper Left, Three Double-Pole Double-Throw Switches Ganged for Simultaneous Operation; Right, Dials May Be Locked in Any Position by Machine Screw through Tapped Hole in Dial



UNEQUAL CAPACITIES IN PARALLEL



UNEQUAL CAPACITIES IN SERIES



EQUAL CAPACITIES IN PARALLEL



EQUAL CAPACITIES IN SERIES

Left, Fixed Condensers Connected to Form Units of a Desired Capacity; When Connected in Parallel the Capacities Are Merely Added, but When Connected in Series the Condition Is Radically Changed and the Capacity of Two or More Condensers Is Less Than That of the Smallest Single Unit; Right, When Working with a Set Which Has Recently Been Connected to Batteries, Eliminators or Power Line, a Screwdriver with an Insulated Handle Should Be Used as Shown to Discharge By-Pass or Filter Condensers, to Prevent an Unexpected Shock; These Slight Shocks Are Not Dangerous, but May Cause the Operator to Jump and Knock the Set to the Floor





Tracking Down Radio Interference by Means of a Specially Designed Portable Receiver

Tracing Radio Interference

A midget portable radio set is the implement of science today in searching out elusive sources of interference that frequently disturb an entire neighborhood. These specially designed sets are extremely sensitive to radio interference and will trace troubles caused by electric refrigerators, oil burners or other electrically operated apparatus. The remedy is in the form of suitable filters which effectually stop such interference, once the source is located.

Bared Leads Aid in Voltage Testing

Most B-power units have all the terminals covered with insulating material. This is a necessary precaution, but makes it rather awkward for the owner to find a place to put the prods of his voltage-testing meter. Loosen the terminals and pull

back the wires about $\frac{1}{8}$ in. and fully tighten each terminal, 1 short bared wire for the test p makes it easy to obtain a corre quickly, and there is little dan ing a shock from the small unce tion of wire.—E. T. Gunderson, boldt, Iowa.

Neutralizing the Old Neutr

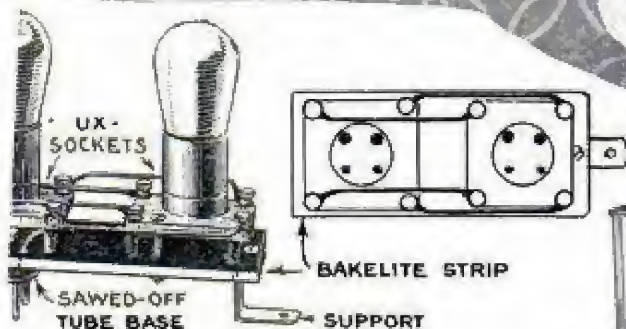
When the radio-service man, man around the neighborhood, in to look over an old neutrodyn he usually runs up against a puz ation. Using the standard metho tralizing does not seem to work set continues to oscillate. This is due to the new type of tube bases of bakelite instead of bra remedy is to connect the metal the old-style sockets in the r.f. sta a short piece of wire and then n each stage in the usual manner. will then be restored to normal c without oscillation. If the tube: X-type sockets, it will be nece wrap thin copper or brass bands the bakelite bases and connect ti bands as in the case of the shell: old-style sockets. Modern neu condensers of the screw-adjustme should be substituted for the old —D. A. Brown, Marion, Ohio.

FOR THE RADIO BUILDER

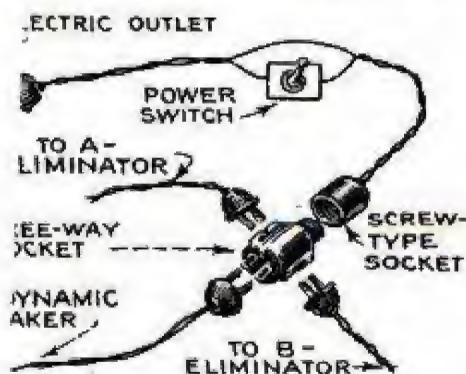
The blueprints below include the best of ular Mechanics tested circuits. When ord simply quote numbers of blueprints desire inclose proper amount addressed to P Mechanics Magazine, Radio Dept., 200 E tario St., Chicago, Ill. Magazines cont full descriptions of the circuits can be obt Send 25 cents for each magazine desired, 1 date of publication.

No. 111, Homemade Tube Tester	July 1926
No. 115, 15 to 550-Meter Three-Tube Receiver	Nov. 1926
No. 116, Three-Tube Loop Set	Dec. 1926
No. 123, Economy-Nine Super-heterodyne	Nov. 1927
No. 130, One-Tube Short-Wave Adapter	Mar. 1928
No. 134, Edison Type B-Battery	July 1928
No. 138, Screen-Grid Perfect-Tone Six Receiver	Nov. 1928
No. 139, Simple Television Receiver	Dec. 1928
No. 140, Power Amplifier and B-supply for Television	Jan. 1929
No. 142, Two-Tube Screen-Grid Short-Wave Adapter	Mar. 1929
No. 143, Four-Tube Screen-Grid Receiver	May 1929

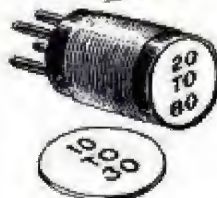
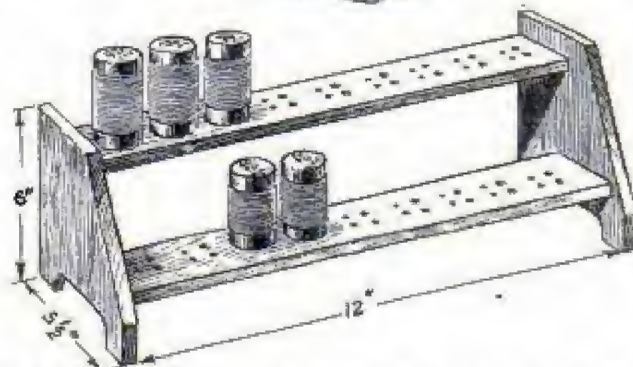
RADIO LAB.



Tubes of the Same Type in Parallel in the Last Stage for Better Tone and Volume; the Unit Is Plugged into the Last Socket



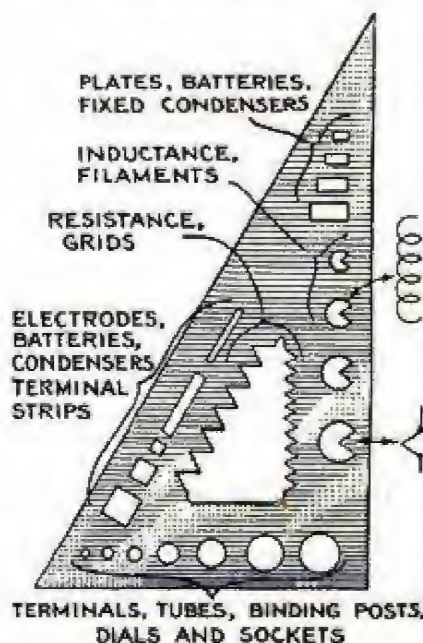
Left, a Diagram Showing How a Single Switch of the Power Type May Be Used in the Line to Control Three Radio Tubes; Mount the Switch at Any Convenient Position on the Cabinet or on the Panel of the Set



Above, a Handy Rack for Plug-In Coils or Tubes for the Workbench; the Coils Are Labeled for Identification with Cardboard Disks, as Shown



Left, a High-Resistance Unit, Provided with a Shunting Button and Designed for Controlling the Speed of a Television Motor, May Be Connected in One Side of the Line Supplying an Electric Soldering Iron to Prevent Overheating; for Quick Start, the Device May Be Turned On Full and the Button Pressed Down, after Which a Suitable Temperature May Be Maintained by Adjusting the Resistance; Right, a Drawing Triangle, Drilled and Cut to Be of Aid in the Drawing of Radio Circuits; Many Other Symbols besides Those Shown May Be Drawn by the Same Method





Speedy Lightweight Kayak Easily Built

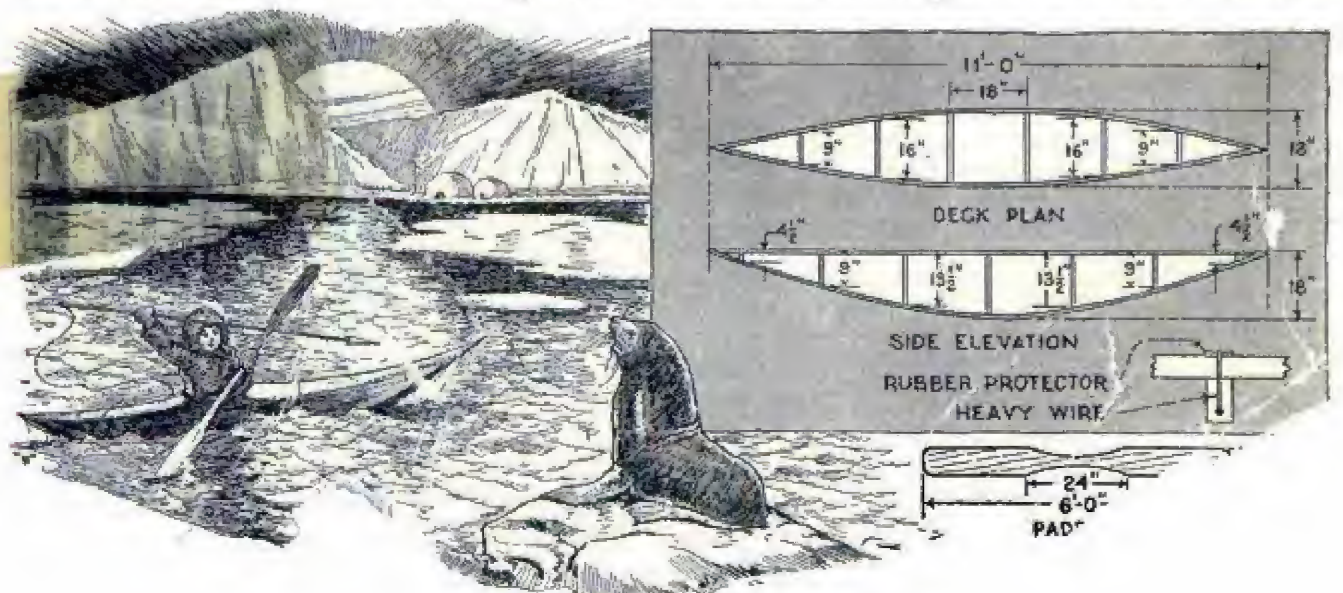
By D. R. HOAG

*2917 Magneto Belu
Spokane Wa*

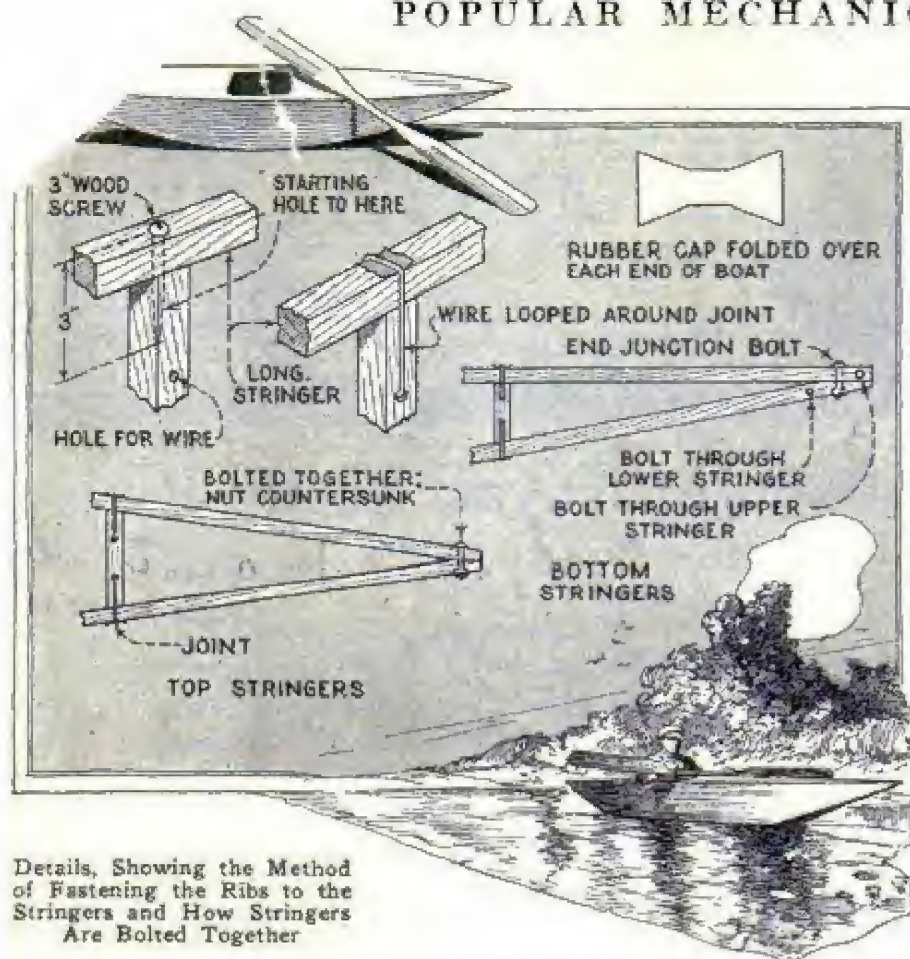
REMARKABLE speed and ease of handling, owing to its exceedingly light weight, are the features of the Éskimo kayak, a small water craft originally made of whalebone and sealskin by the native Eskimos. The modification described in this article is made of wood and canvas, but nevertheless is so light that, when loaded, it draws only 6 to 8 in. of water. This makes paddling very easy and considerable speed possible. While intended for one passenger, it can be enlarged to accommodate two, if desired. The weight of a one-passenger kayak is about 15 lb., and the cost of material approximately \$7.

The framework is first constructed. It consists of 1 by 1-in. white pine or spruce strips, which should be clear and straight-grained. Pieces having knots should not be used under any circumstances. The four stringers are 12 ft. long, and a number of crosspieces and ribs are spaced between them as shown in the deck plan and

side elevation. To prevent splitting the pieces, they should be kept wet an hour or so before bending them. All the joints are made by means of wood screws, driven into lead holes; the joints are reinforced with heavy wire. The reinforcing is done by drilling a fine hole through the rib, about 4 in. below the joint, then threading a wire through the hole and around the stringer, as indicated in the detail. A piece of rubber cut from an old inner tube is placed between the wire and the canvas to reduce wear. The best method of assembling the frame is to cut and fasten the ribs nearest the center of the stringer. Then the stringers are bent and the rest of the ribs fastened in place. The ends of the stringers are bolted together as follows: The upper right-hand stringer is bolted to the upper left-hand stringer, and the same procedure is followed with the other pair. Both pairs of stringers are then bolted together with two bolts at



Only Fifteen Pounds and Draws But
Speed and Ease of Manipulation



Details, Showing the Method of Fastening the Ribs to the Stringers and How Stringers Are Bolted Together

each end. The heads of the screws and the nuts are countersunk, and a piece of rubber is cut to form a cap to fit over the ends as protection for the canvas. Altogether, the amount of lumber needed for the frame is six lengths of 1 by 1-in. stock, 12 ft. long.

Cover the frame with medium-weight canvas, of which about 6 yd. are required. It is cut to fit each side separately, and the pieces are sewed together on a sewing machine, leaving about two-thirds of one seam unsewed so that the cover can be slipped over the frame. The open seam is later sewed by hand. An opening, about 18 in. across, is left to form a cockpit, located in the exact center of the boat. The outside of the cover, when in place, is given an application of paint, consisting of white lead and linseed oil. The first coat should be very thin, so that it will soak into the fabric, and the second coat should have the consistency of ordinary paint. Finally, a coat of good enamel is applied, care being taken to avoid leaving spots.

is double-bladed, and is as good as the framework. It is 1/2 in. wide, and 1 in. thick. The blades are sandpapered and

given two coats of waterproof varnish. As paddling a kayak requires some practicing, it is advisable, while learning, to fasten a gallon can, with the lid on tight, on each side of the boat, just at the waterline, to prevent capsizing.

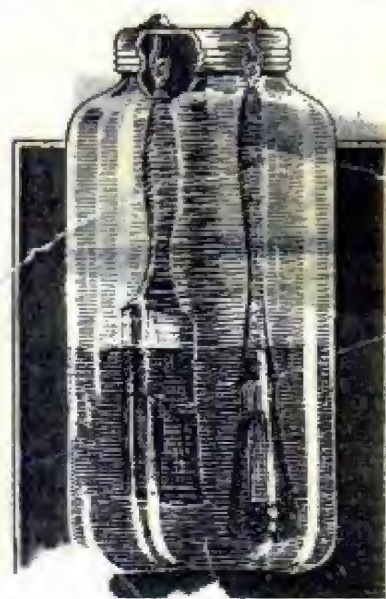
Homemade Cleaning Fluid

Here is a fluid that my wife has found very efficient in cleaning materials, from the heaviest and coarsest to the most delicate fabrics, without injury to them. All the chemicals used can be purchased at a drug store, and it will be found that it is cheaper to mix up a large quantity than a

small one. The constituents of the cleaner are as follows: Carbon tetrachloride, 80 per cent; diethyl ether and benzene, each 10 per cent.—P. C. Shera, Columbus, Ohio.

Non-Evaporating Paint-Brush Holder

It is not practical to put paint brushes in turpentine or lacquer thinner in an open can for any length of time, as the liquid soon evaporates, leaving the brushes exposed, so that they will harden if they are not thoroughly cleaned out. A non-evaporating paint-brush holder is shown in the drawing and has been found successful. Take a fruit jar, preferably of glass for



Wallpaper Screens



they can easily be overcome by following the methods described in this article. For best appearance, the lower crosspiece of the frame should be about 6 in. from the end, and the 6-in. portion extending beyond the crosspiece should be cut or planed off at a slight angle. This forms a neat foot and eliminates the appearance of bulkiness. Before planing the foot as just described, it is necessary to glue a small block of wood in the rabbet, as shown in Fig. 3, as the rabbet of the sidepiece should not extend to the end; if it did, it would involve a complicated joint for the crosspiece, and, if the rabbet were not filled in, it would look like poor work-

manship, even if done by an amateur. Therefore, it is suggested that the above method be carefully followed by those not familiar with woodworking procedure.

To make screen frames having the top built up of three separate pieces, as the screen in the right-hand photo of the heading, and in Fig. 2, it is necessary to make use of a miter box for cutting the ends accurately. In this case, the upper ends of the sidepieces and all the ends of the top pieces were cut at a $22\frac{1}{2}^\circ$ angle. It is a good idea to cut these small pieces out of longer pieces already rabbeted. Now, the problem confronting the worker is how long to cut the three top pieces so



Upper Left, Rabbeting Stock; Inset, Antiquing the Frame; Lower Right, Tacking in Molding

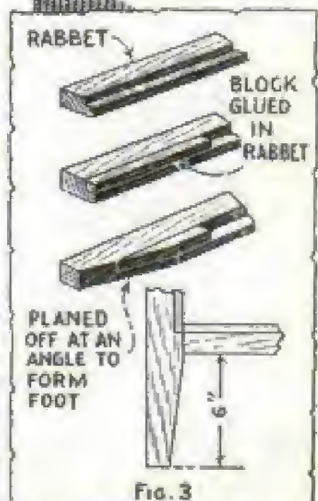
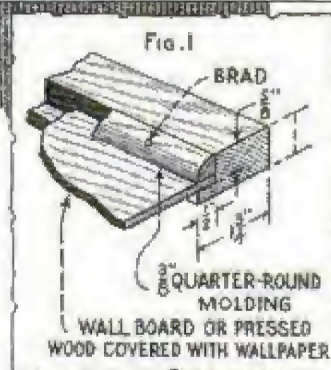
that the straight-line span across them is exactly equal to the predetermined width of the frame. Guesswork will be eliminated entirely by following the simple method shown in Fig. 4.

A layout of the screen frame, exact size, with a square end, is made on a large sheet of paper. Equal distances AB and BC are then measured from the corners, after which a diagonal line is drawn from A to C, representing the outside edge of the frame. Take a length of the stock to be used and draw the inner line so that the two lines are parallel and the space between them is equal to the width of the stock. Repeat the procedure on the opposite corner. Now the dimensions can be readily taken and transferred to the wood to be cut. The pieces are then assembled and fastened together securely by doweling, by nailing with finishing nails, small holes being drilled to prevent splitting the wood, or by using corrugated

fasteners, all three methods being shown in Fig. 4. The doweling method is the best, but it is a trifle more difficult than the other methods as it involves drilling holes in perfect alinement. If you intend to use plastic paint on the wood for finishing, it is a good idea to use corrugated fasteners at the joints.

In respect to the width of the screen sections on which wallpaper is to be used, it should be remembered

that wallpaper comes in certain sizes and care must be taken that the frames are made



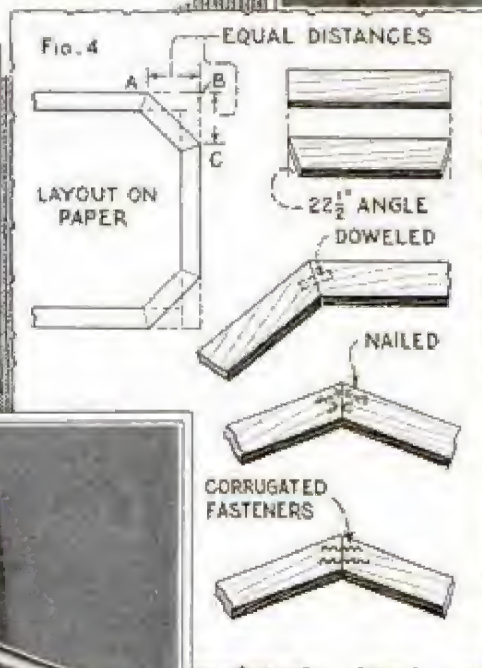
accordingly. Frames slightly narrower than the paper are permissible but the predicament of having a frame too large cannot be overcome except by remaking the frame. Most standard wallpaper made in this country comes in 18-in. widths, although much wider paper can be obtained, especially that of foreign manufacture. The width of the frame, from the bottom of the side-rail rabbets should be equal to or slightly smaller than the width of the wallpaper to be used, as indicated in Fig. 2, allowance being made for the trimming which is cut off.

The panel is now cut out of wallboard or pressed wood. See that it fits in the frame before applying the wallpaper. Get some wallpaper paste and mix it well until it is free from lumps. Give the paper a medium-heavy coating, and apply it to the wallboard. Trim off the projecting edges with a safety-razor blade and turn the panel over on a clean surface, so that wallpaper can be applied to the other side. It is a good idea to use the same kind of wallpaper on both sides, even if the design and coloring are slightly different, as one kind of paper expands much more than another after it has been moistened with paste, and upon drying, it will also contract much more and for this reason the use of two differ-



Anyone Can Saw the Wallboard; Apply the Paper and Finish the Frames as Shown in the Above Photos

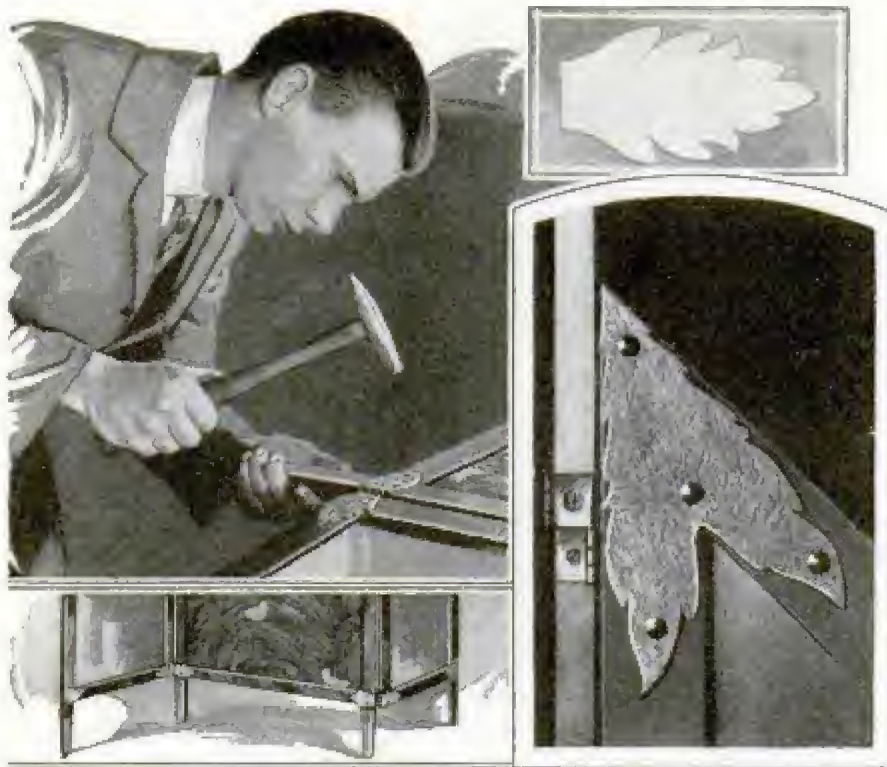
ent kinds of paper may cause the panel to buckle slightly. Cover both sides of a panel, one immediately after the other, so that the drying out of both will take place at the same time, which reduces the tendency to buckle. Unless special washable wallpaper is used, one should apply a couple of coats of shellac to the finished surface, which makes it easy to keep the paper clean. However, there are some kinds of paper that have a printed finish which is ruined by the application of shel-



lac or any other transparent covering, and in such cases the paper should be left as it is.

The frames and molding are finished before the panels are set in. Slow-drying lacquer has been found handy for finishing. An excellent finish can be obtained by antiquing a red surface

with burnt umber, using a wad of cloth to apply the umber. Another rich finish can be had by lacquering the frame black and then giving a very slight spray of gold bronze, varying the shading of the latter from a dust effect to a noticeably solid coating. A hand spray gun will be found useful for such work. Before finishing the frames, they should be well sandpapered and all the nail holes should be filled with plastic wood or putty. If, however, you find that the joints are marred more or less, and detract from the otherwise excellent appearance, make some imitation hinge leaves out of sheet lead, obtainable at a plumbing store. Two designs of such hinge leaves are shown on



Ornamental Hinge Leaves. Cut from Sheet Lead and Painted with Gold Bronze. Cover the Joints and Add to the Appearance of the Screen

this page, the lower one being especially suitable for use on a sharp corner. The hinges used to fasten the screen sections together, should be attached between such ornamental leaves, as indicated, but this is done after each section is completely finished. Hammer the hinge leaves lightly with the cross-peen of a small hammer, to make them look like hammered brass, then coat them with gold lacquer on faces and edges, rubbing the gold off the faces before it dries. This will leave the gold in the hammer marks, and, when the leaves are applied with large-head hammered-iron nails, they will look very ornamental.

After the frame is ready, the panel is laid in and the molding is cut, painted to harmonize nicely with the rest of the frame, and it is then nailed on, small finishing nails being used for the purpose. The nails are countersunk and the holes above the heads are filled and afterward touched up with paint or lacquer. If the molding projects a trifle over the edge, remove it from the frame and lay it on a flat board. Use a small plane to reduce its size slightly, until it fits flush in the frame. After the individual sections of the screen have been completed, they are hinged together with $\frac{3}{4}$ -in. double-acting brass hinges, which make it possible to set the

screen in almost any desired position.

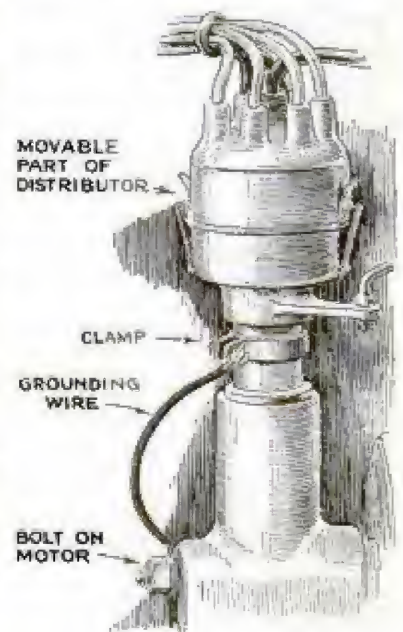
The screen shown in the left-hand part of the headpiece has a center section 6 ft. by 30 in. in dimensions and is covered with a high-grade imported wallpaper having a peacock-feather design, green, yellow and black being the predominant colors. The sharp angles of the end sections give the screen a modernistic touch. Black lacquer is used to finish the frames, and over this gold bronze is sprayed, the coating being graduated from a solid gold at the corners to a dusted effect in the center. The right-hand screen has a

frame finished in antiqued red. A Japanese-design wallpaper, red on one side and black on the other, gives the screen a variety of color.

Grounding Wire on Distributor Improves Engine Operation

The owner of a car which was provided with the usual distributor type of ignition system, found that the engine missed at certain speeds. Change of spark plugs, contact points and wiring did not remedy the trouble. The car had been driven

about 50,000 miles and the parts were worn to some extent, but not so badly as to necessitate an extensive overhauling. After some experimenting, the owner attached a ground lead from the head of



the distributor to the engine as shown. This was found highly effective in correcting the trouble. The fault evidently was due to wear of the distributor head and its sleeve, and the lubricant prevented a good ground.

Easily Made Photo Lamp

An incandescent lamp that gives more actinic light than a small arc lamp, allowing full exposures in as short time as a second, can be made from a piece of tin, a socket and a suitable bulb. On a base of 1-in. material, mount a "mogul" socket as shown. A support for the socket can be obtained at an electrical store. Get a piece of bright tin, 14 in. wide and 15 in. high. Turn over the edges, to prevent cutting the hands, and also the bottom about $\frac{1}{2}$ in., so that it can be attached to the base. Before mounting, cut the flange at 1-in. intervals and then roll the reflector to a concave form. Fit the socket with a 1,000-watt incandescent projection lamp, which is sufficient for ordinary exposures when a reflector is used. Two lamps will give enough illumination for motion pictures, or portraits of one-second exposures at f:11. Snapshots may be made with a f4:5 lens. When using



Sailing Fast over the Sidewalks on Roller Skates Was Found Great Sport by Two Cincinnati Boys



incandescent lights, it is important to remember that the farther the lights are from the subject, the more detail will be shown. A distance of about 10 ft. gives pictures in which the high lights are not "plugged-up."

Making the Most of the Summer Breeze

By using a sail as shown in the photo you can harness the wind to speed your skating. Two Cincinnati boys, Fred and Wilby Schafer, started the fun. Their sails consist merely of a piece of canvas attached to two stout crosspieces as shown, one of which is lashed to the end of a mast. A length of sash cord is tied to the ends of the lower crosspiece, and this is held over one forearm while the mast is held with both hands, as shown in the right-hand photo. To stop, it is merely necessary to let go the rope, permitting the sail to flutter freely in the breeze.—J. R. Schmidt, Cincinnati, Ohio.

Waterproof Cover for Tourist's Bedding

A waterproof cover, made to fit over the tourist's bedding neatly folded on the top of the car, will solve the packing problem. The bedding can be removed without disturbing the arrangement of the other luggage. Snap fasteners, the kind used to button on auto side curtains, are attached to the edge of the top so that the cover can be fastened down securely.

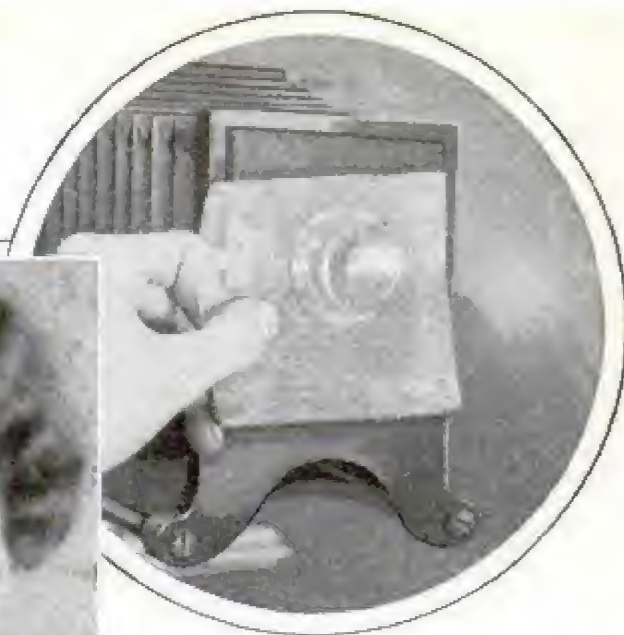
Diffusing Screen for Camera or Enlarger

Some photographs are more pleasing when slightly diffused or softened. One of the simplest methods of producing this effect is to hold a piece of finely woven



Many Photographs Can Be Improved Considerably by Diffusing the Light Rays during Exposure

wire screen in front of the lens of the camera or enlarger as shown in the photo. Bright bolting screen, such as is used in cereal making, has been found highly satisfactory for this purpose. Darker screen material produces less diffusion. The light is scattered slightly when passing through the screen, causing the desired

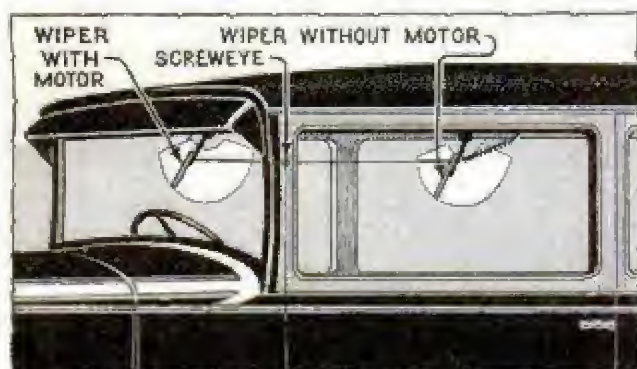


effect, but it is necessary to give a little longer exposure. The best practice is to make a sharply focused negative and then to do the diffusing with the enlarger. However, in moving-picture work, the diffusing screen is placed in front of the camera lens when taking the picture. Another little trick is to punch or burn a small hole in

the center of the diffusing screen so that a picture sharp in the center and diffused at the edges is produced. For a portrait, the screen should be held so that the eyes of the subject will be sharp. The accompanying photos show a portrait in sharp focus and one that was diffused by the use of a screen.

Side-Window Wiper for Auto

To obtain clear vision through the side window of an auto during a rainstorm, an



Extra Wiper Arranged on the Side Window Provides Vision during Rainstorm

extra window wiper may be installed, as shown in the drawing. I have used one for some time and find it absolutely satisfactory. The extra wiper is pivoted to the door frame, and a coil spring is attached as indicated, to pull the wiper toward the rear when the forward pull, accomplished by means of a string attached to the windshield wiper, is released. A small screw-eye is driven to guide the string into the corner post at this point.—Jerome L. Massett, Savannah, Ga.

☞ Woolen materials can often be darned with threads unraveled from the material, split silk, or hair so that the garment will again be presentable.

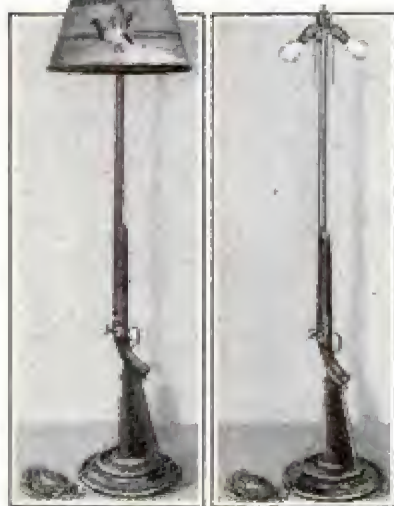
Checking Fly-Breeding in Manure Piles

One of the most effective chemicals to apply to manure piles to check the breeding of flies is borax, which does not injure the fertilizing properties of the manure. As soon as the manure is removed from the barn, sprinkle some borax over it, using a fine sieve. Apply it around the outer edges of the pile, as the maggots seem to collect there; then throw a few gallons of water over the mass.

Closing Bolt Holes in Rear of Ford Coupe

Ford model-A roadsters or coupes, which are not equipped with a rumble seat, have four bolt holes in the bottom of the rear compartment. The holes are located just ahead of the inclined ledge on which the rumble-seat cushion is placed, when one is supplied. The holes should be closed by bolts with washers, as otherwise water will be thrown from wet roads into the rear compartment through them.

Floor Lamp Made from Old Rifle



An old gun can be made into a useful and ornamental lamp as shown in the photo. Make a suitable base about 12 in. in diameter and about 2 in. thick. It should be turned down to a suitable shape on a wood lathe. The butt plate of the gun is removed and two large wood screws or lag-bolts, $\frac{3}{16}$ by 4 in., are used to fasten the gun securely to the base. Fittings such as double sockets for lamps can be purchased at a store handling electrical supplies. The cord is run through the barrel and, if desired, also through the stock, in which case a hole must be drilled for this purpose. In a muzzle loader, a hole is drilled through the breech or side of the barrel, large enough to pass the wire.—E. A. Cleveland, Montreal, Can.



Metal Hook Made to Fit on Shoulder Is Less Tiring Than a Neck Strap for Saxophonist

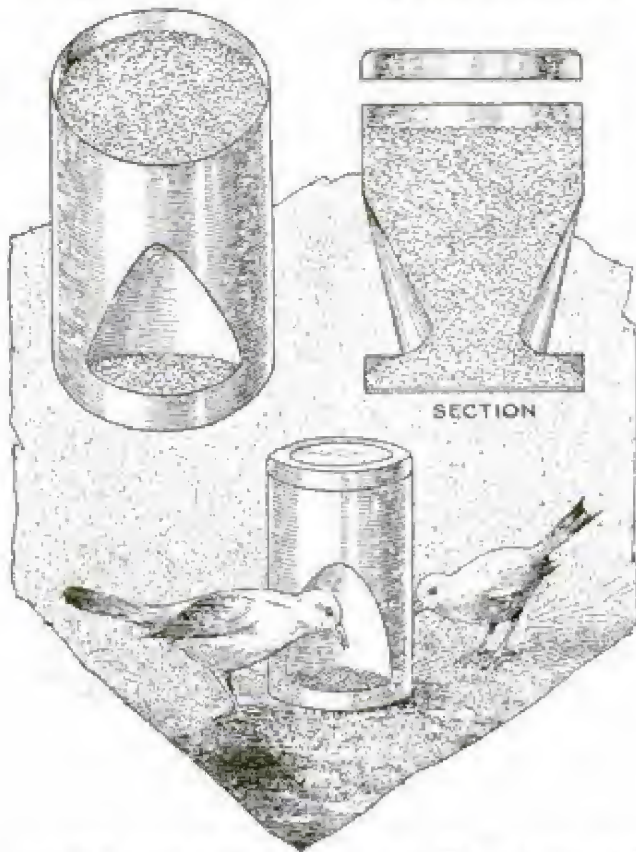
Hook over Shoulder Holds Saxophone

As it is easier to carry a weight from the shoulder than from the neck, I found that a hook large enough to slip over my shoulder was more comfortable than a neck strap for supporting a saxophone. I made the hook out of some heavy wire that was not too difficult to bend. Obviously such a hook could also be made from a strip of flat, springy metal with felt on the inside if desired.—C. L. Meller, Minneapolis, Minn.

Fruit-Jar Rubbers Prevent Rug Skidding

Slipping of rugs on polished floors can be prevented by sewing rubber fruit-jar rings to the underside of the rug, near the corners, as shown in the photo. For a small rug, one ring at each corner is sufficient, but for a larger rug several rings should be spaced at equal intervals along the edges. The rings, being thin, will not cause uneven wearing of the rug.





It Takes Only a Few Moments to Make These Bird Feeders from Tin Cans

Practical Feeders for Various Birds Made from Tin Cans

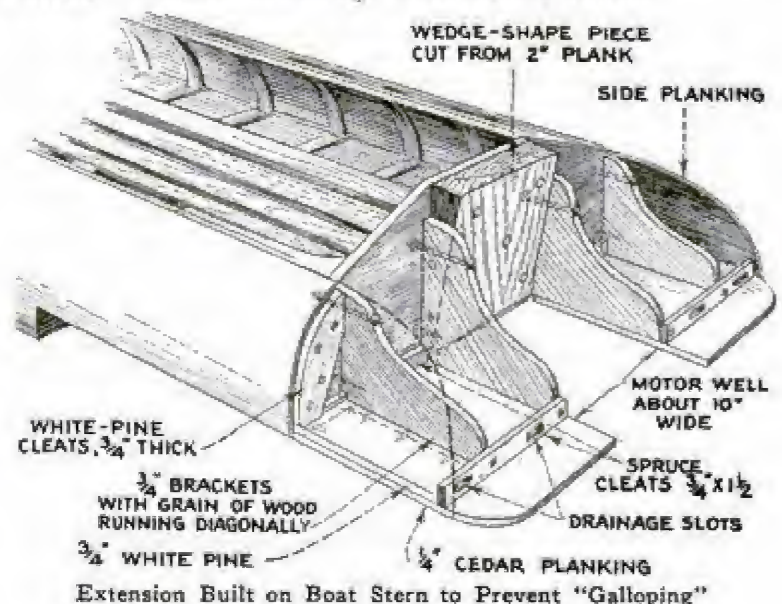
Take a can of suitable size and cut a slit horizontally about an inch above the bottom, as shown in the illustration. This slit should be about $2\frac{1}{2}$ in. long, if the feeder is to be used for chickens, and about 2 in. long for smaller birds. After the slit has been cut, simply press in the portion directly above it, making an opening which allows the bird to get at the feed but prevents the feed from running out of the can. If desired, two or three of these openings can be made in a can, depending on its size.—G. M. Beerbower, Hollywood, Fla.

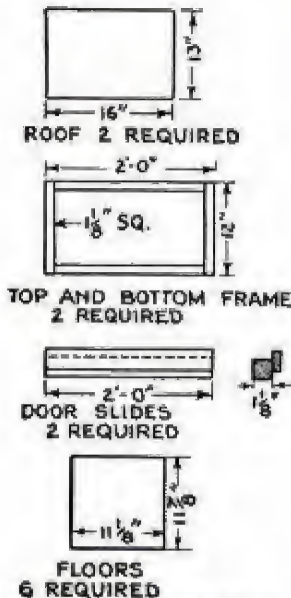
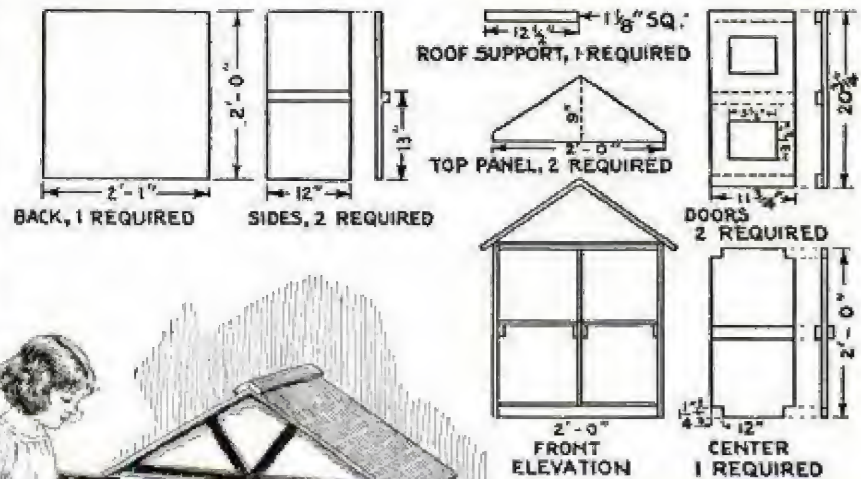
Painting Lead Pipe

Ordinary paint cannot be used successfully for painting lead surfaces unless some substance is added to serve as a primer to seal the lead and prevent sweating of the pipe. An effective primer for this purpose is waterproof varnish. One coat should be sufficient. After this has dried, apply the regular paint.—L. H. Georger, Buffalo, N. Y.

How to Remedy "Galloping" Outboard-Motor Boat

Last year I built a step plane for outboard motor racing, and it ran well with a moderate-powered engine. However, when I used a larger motor it began to "gallop." Nose and stern would rise 5 or 6 ft. in the air and then slap the water with a whack, and every slap meant another black and blue spot on my anatomy. Naturally no boat could stand that terrific pounding for any length of time, and I soon discovered a broken crossframe and a split plank. In many boats this tendency to gallop can be overcome by tilting the motor back farther from the stern. If this does not correct the trouble, try cutting some wedges from 2-in. planks, bolting them to the stern to support the motor. This will enable you to tilt the motor back still farther, and may correct the galloping but will slow down the speed if the motor is tilted too much. Timing with a stop watch will tell you whether or not it is practical to tilt your motor. In my case, I had to extend the bottom of the boat about 1 ft. before the trouble was overcome. The drawing shows the details of this extension. It is a good plan to have the planking too long and then cut it down, sawing off an inch or so at a time and then trying the boat until you get satisfactory results. All the joints are well covered with liquid marine glue before they are screwed together. After the construction is finished, sand the planking and finish to match the boat.—H. E. Whiting, Rochester, Minn.





Doll's House Made of Wood without Any Joinery and Decorated Inside with Wallpaper; the Whole Front Opens to Expose the Interior

Doll's House Made without Joinery

A doll's house, having sliding doors and made entirely without any joinery, is shown in the illustration. The top and bottom frames are made from wood, $1\frac{1}{8}$ in. square. They are fastened together with screws, cross strips being tacked diagonally to brace them until they are in position. The sides, floors and top are made of $\frac{1}{2}$ by 6-in. wood, nailed to the frames. The front of the house is divided in the middle and the halves slide outward to expose the whole interior. If desired, the inside of the doors can be covered with wallpaper to improve the appearance. The sides and back are covered with a crepe paper having a red-brick pattern, which is pasted to stiffer paper, the

latter being glued to the sides. Wallpaper having small patterns can also be used for the interior decoration. The front of the house and the doors are painted white, ordinary lath, painted black, being nailed on in some suitable design.—Harold Moore, Birmingham, Eng.

Protection for Tree Base and Roots

A neat and practical method of protecting a tree base and retaining moisture around it on a slope is shown in the accompanying photo. A semicircular concrete curb, from 18 to 24 in. deep, is built around the tree. This will not interfere in any way with the lawn, but will add to its appearance. Painted white, the concrete gives a pleasing decorative effect.



Concrete Curbing, Built around Tree Base on Slope, Retains Moisture, and Adds to the Appearance

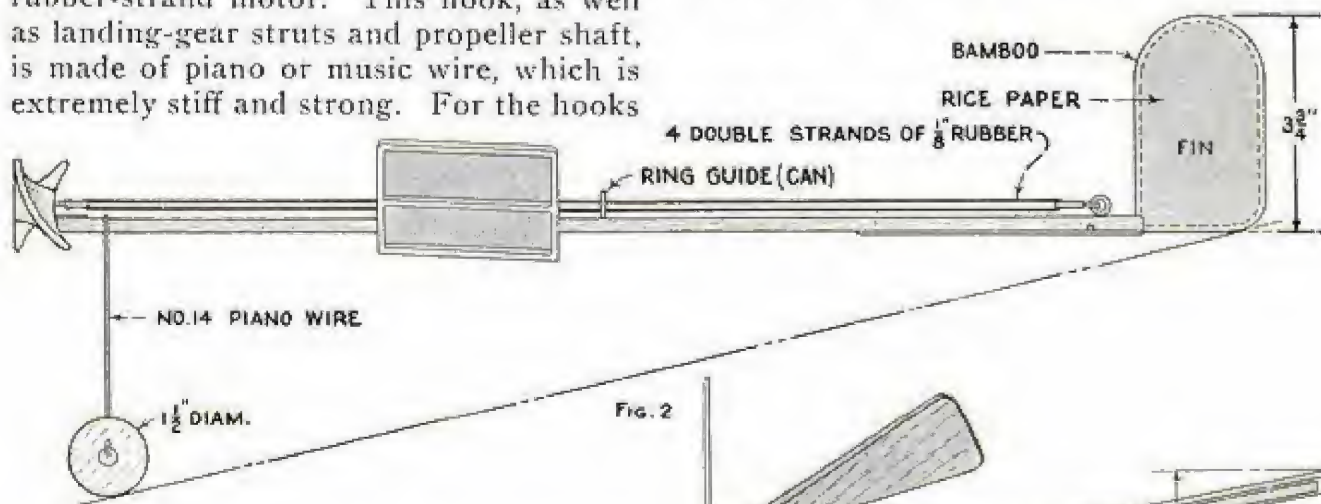
PRIZE-WINNING MONOPLANE

by
HI SIBLEY

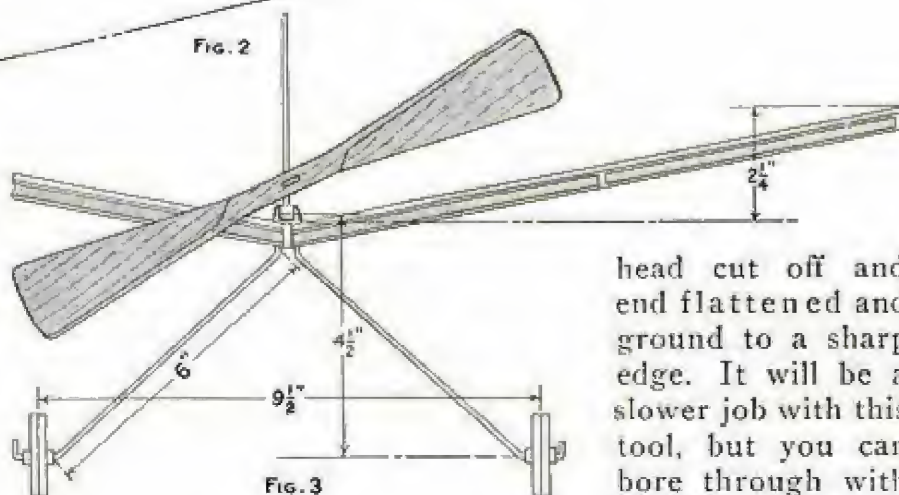
metal as well as wood. Figs. 1, 2 and 3 give the general dimensions of the flyer, and illustrate the relative positions of the various members of the assembly. Begin with the motor stick or main frame piece. This is of $\frac{1}{4}$ -in. square-section balsa wood, 20 $\frac{1}{2}$ in. long. In spite of its lightness and apparent sponginess, it has surprising strength when properly applied in construction. First install the tail ring for the S-hook that carries one end of the rubber-strand motor. This hook, as well as landing-gear struts and propeller shaft, is made of piano or music wire, which is extremely stiff and strong. For the hooks

nose pliers comes in handy for bending.

The propeller-shaft bearing is made from a brad, about $1\frac{1}{8}$ in. long, with the head and front portion flattened. A small hole for the shaft is drilled either with a fine twist drill or the tool shown in the center drawing, Fig. 4. This consists of a brad driven into a wooden handle, the



use about a No. 14 wire. If you are not familiar with piano-wire gauges, which are different from standard gauges, select a wire that is about the size of leads in patented magazine pencils, or a stout hairpin. A pair of small-



head cut off and end flattened and ground to a sharp edge. It will be a slower job with this tool, but you can bore through with

a little patience; and unless you have patience you should not attempt to make a first-class model plane.

Set the completed bearing on the front end of the motor stick so that it extends about $\frac{1}{4}$ in. Cover liberally with ambroid and bind tightly with linen thread. In the center of the stick, mount a guide ring or "can." about $\frac{1}{2}$ in. in diameter and made of No. 12 or finer piano wire. In bending the various pieces of wire to a round shape, use a piece of dowel stock

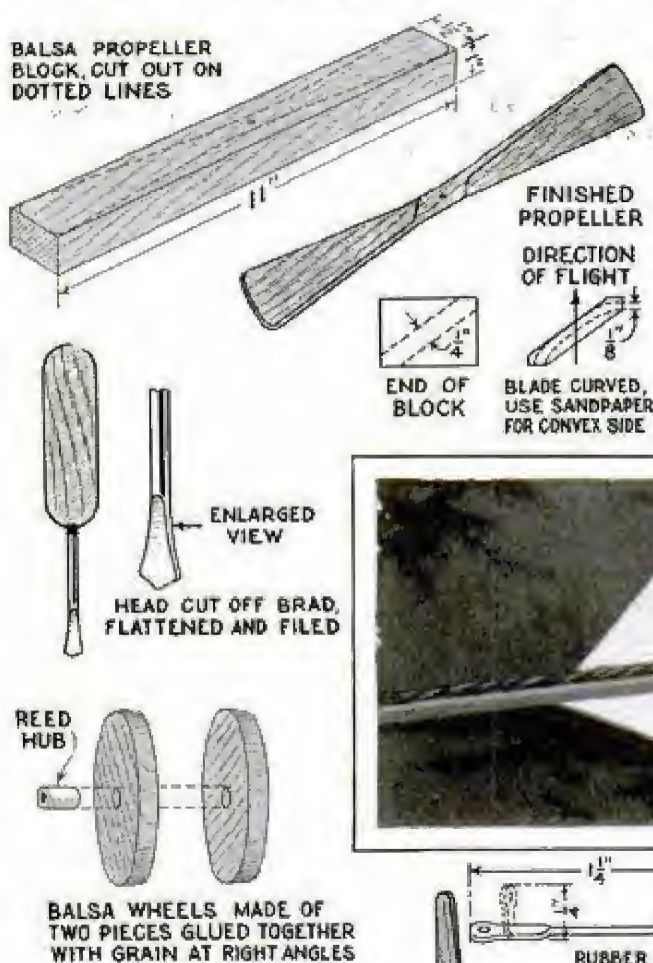


Fig. 4

Center Photo Shows Stabilizer and Fin; Note the S-Hook and Tail Ring

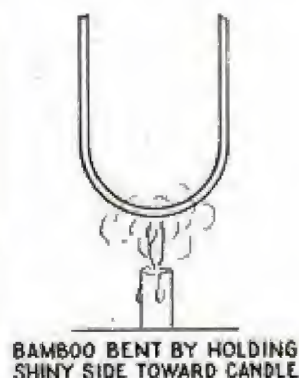
of the required size for a form. This can prevent the motor stick from springing under the strain of the wound-up motor. Tail ring, can, propeller bearing and S-hook are all detailed in Fig. 6 and the bearing also in Fig. 5.

Next in order is the cross spar for the stabilizer, Fig. 5. Use bamboo, $\frac{3}{32}$ in. square and $8\frac{1}{2}$ in. long. This is set in a notch on the bottom side of the stick and

secured with ambroid and thread (Fig. 5 shows the assembly upside down, to illustrate the notching). Making the frame for the vertical fin will test your skill. This is of split bamboo, about $\frac{1}{16}$ in. thick (the thickness should be as uniform as possible), and is bent to the required shape by heating the shiny side over a candle flame. Do this gently and gradually. The ends are set in grooves cut in the motor stick with a sharp knife. Ambroid and thread will secure them firmly to the stick.

The efficiency of the propeller depends entirely upon your skill in whittling balsa wood. The greatest caution is required, for a sharp knife will slice through as easily as in a dry cornstalk. Only light cuts should be taken; otherwise you may snip off a blade before you realize what has happened.

Mark the outlines, as in Fig. 4, on the flat side of a balsa block, 11 in. long, $1\frac{1}{2}$ in. wide and 1 in. thick. Whittle away



BAMBOO BENT BY HOLDING SHINY SIDE TOWARD CANDLE

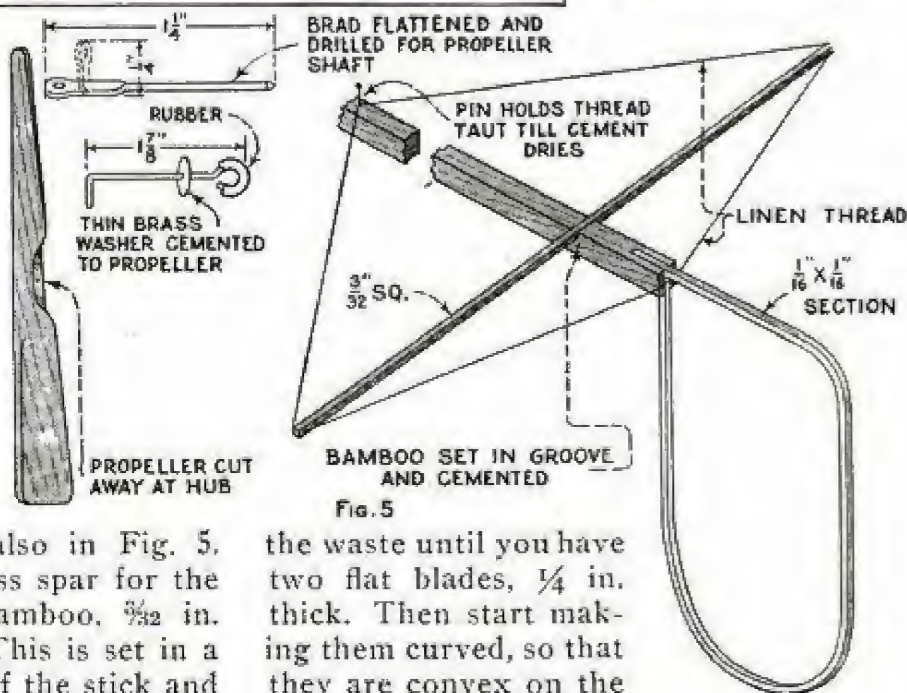
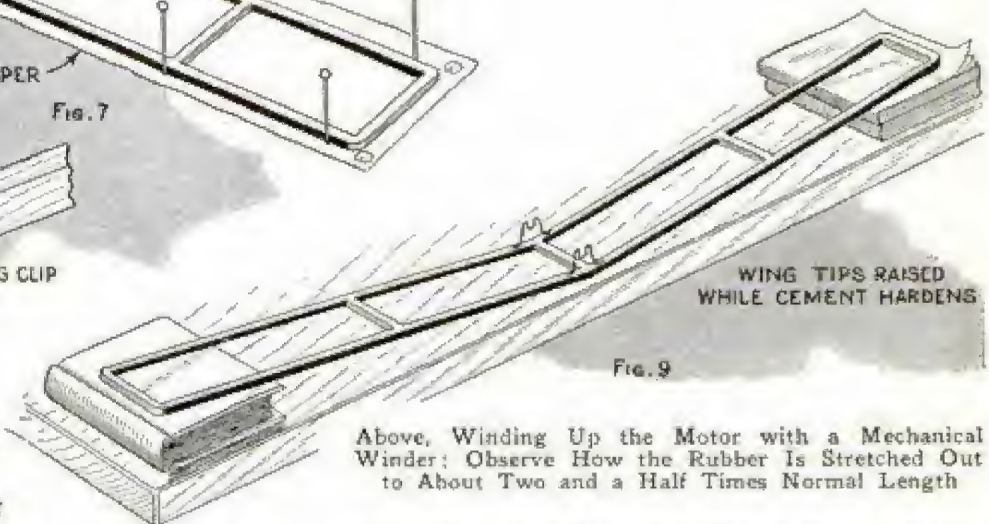
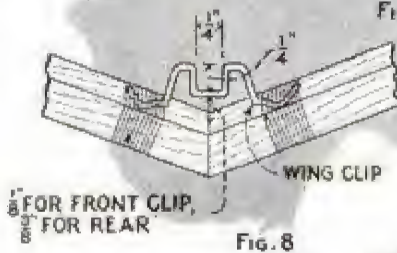
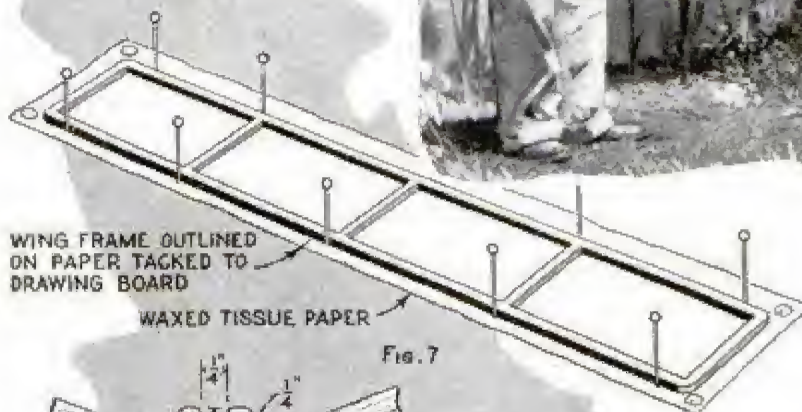
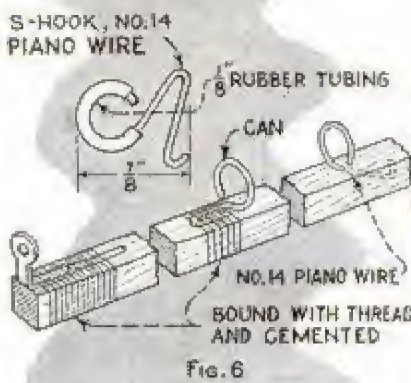


Fig. 5

the waste until you have two flat blades, $\frac{1}{4}$ in. thick. Then start making them curved, so that they are convex on the



Above, Winding Up the Motor with a Mechanical Winder; Observe How the Rubber Is Stretched Out to About Two and a Half Times Normal Length

front side and concave in back. The sanding is best done with a piece of coarse sandpaper over a block of wood rounded about the same as the finished blade is to be. The completed blades will then be about $\frac{1}{8}$ in. thick and have a graceful form. To clear the motor stick, a section, about $\frac{1}{2}$ in. deep and $2\frac{1}{2}$ in. long, is cut away from the back side of the propeller at the hub. With a steel pin make the shaft hole exactly in the center and be sure it is square with the propeller. Otherwise the propeller will wobble. Make a small washer of thin sheet brass and secure it to the hub with ambroid. Now insert the shaft, bend a hook in the front end, press it back into the hub, Fig. 5, and cover with ambroid.

The wing-frame construction is simplicity itself. To facilitate the work draw

exact outlines of spars and ribs on a sheet of paper and tack to a drawing board. Lay a sheet of thin waxed paper over the drawing and place the balsa pieces in position on it. The waxed paper prevents the job from sticking to the paper, and can be trimmed away easily. See Fig. 7. Apply ambroid at the joints and draw them tightly together while drying by means of pins stuck into the drawing board. This assures a perfectly square and flat wing.

Apply a thin film of good glue to the top edges of ribs and spars and stretch Japanese rice paper tightly over them, holding the extending edge by means of thumbtacks or weights until the glue is dry. Rice paper is a better "fabric" than ordinary tissue paper because of its toughness. It does not tear easily. When dry, trim away the waste for a neat job. Paper can be fastened to the fin frame by gluing

the edges and, holding the plane sideways, pressing the frame down on a sheet of rice paper tacked to the drawing board, or merely laid flat. On the stabilizer the paper is glued at the edges and folded over about $\frac{1}{4}$ in.

For proper performance, the wing should form a dihedral angle, that is, the wing tips should tilt up so they are $2\frac{1}{4}$ in. higher than the center. This is accomplished simply by breaking the two spars at the center rib. This seems a crude way of doing the job, but, the designers explain, is better than making a clean cut halfway through, because the jagged edges of the broken wood hold the ambroid better. The rice paper is put on before breaking, for the simple reason that it is easier to glue the fabric when the frame lies flat. Two wing clips are made of No. 12

or finer piano wire in the manner shown, the forward clip being $\frac{1}{4}$ in. lower than the rear one, to give the wing its angle of incidence or back tilt. These are also secured to the wing spars with ambroid. They allow the wing to be removed easily for adjustment forward or backward. The wing is held in place by a rubber band, looped under the motor stick and over the upper wing surface in the usual manner.

Landing wheels are cut from balsa sheet with a sharp knife. Two pieces, $\frac{1}{8}$ in. thick and $1\frac{1}{2}$ in. diameter, are used in each wheel, glued together with the grain at right angles so that they will not split. The hubs are made of small sections of $\frac{1}{8}$ -in. reed, such as is used in porch furniture. Axle holes can be drilled with the tool described for boring the propeller-shaft bearing.

The piano-wire struts or landing-gear

legs straddle the motor stick $1\frac{1}{4}$ in. from the front end and are secured with ambroid. At least a No. 14 wire should be used; heavier, if you have some on hand.

Four double strands of $\frac{1}{8}$ -in. rubber band, such as the standard sold by parts dealers, are used for the motor. Do not stretch these between the propeller hook and tail ring, but at the same time they should not be loose enough to sag.

The plane is now ready to fly. Best results are achieved by detaching the S-hook at the tail end and winding with a mechanical winder, which is simply an egg beater with the blades removed and a hook or eye attached. Stretch the rubbers out about two and a half times their normal length and for the first few times do not wind over 75 or 100 turns of the winder. The limit is about 150 after the rubbers have been worked in. With a four-to-

one gearing on the winder, this will mean from 300 to 600 turns on the motor.

If winding by turning the propeller, fewer turns can be made because the rubber bands are not stretched as with a mechanical winder, and not more than 75 turns should be taken at first.

This plane is designed either to rise from the ground or to be launched in the air, but, of course, it will give greater distance by the latter method, since altitude is already gained and it does not have to expend its stored energy in a getaway. The wing should be set about 6 in. from the front end of the stick. If the plane has a tendency to dive, set the wing slightly forward. In case of climbing too fast, move the wing back until the proper location is determined.

Of all the planes the writer has seen in flight, this is far and away the best per-



Buddy Wheaton and Alex. Hixon, with the Trophy, a Silver Plane, Won by Their Model Tractor

former for such simple design. But its perfection was achieved only through long and discouraging experience on the part of Alex. and Buddy. They have done all the hard work for us.

Getting Rid of Dandelions

Provide yourself with a 3-oz. bottle of sulphuric acid and a medicine dropper. Fill the eye dropper with the acid and place a drop or two in the crown of each dandelion, which will soon destroy it so that it will never reappear. There are a few deep-rooted plants or weeds that need a second application.

Remedy for Back-Firing Camp Stoves

Gasoline stoves, especially those designed for camping trips, frequently develop troublesome back-firing into the chamber where gasoline vapor and air are mixed. When this happens, the stove emits a steady roar, caused by the flame burning in the chamber, and the burners often go out. A remedy consists in placing a piece of fine wire gauze over the opening leading from the mixing chamber to the burner. This is best done by removing the top of the burner, placing the gauze over the opening, and clamping it down by reassembling the burner. Protruding edges can then be trimmed off. If no gauze is available, a piece of ordinary screen wire, folded to provide two or three thicknesses, will be suitable. It may be found necessary to cover several burner openings with screen before the stove burns right. The wire dissipates the heat so that the gas on the other side will not ignite.—W. E. Burton, Kenmore, Ohio.



Fine Screen Placed over Opening from Mixing Chamber to Burner Prevents Back-Firing

Wire Coil Holds Photographer's Stirring Rod



Coil Spring Hung on Wall Serves as a Holder for the Stirring Rod

To keep his stirring rod in a safe place, yet ready for instant use, one amateur photographer obtained a coil spring of the type shown in the photo. This was attached to the wall with a screw at the top. The coil spring was originally intended for holding moth balls, but if you cannot obtain such a coil, you can make one by wrapping smooth galvanized wire, about No. 12 gauge, about a dozen times around a broom handle. The lower end may either be wrapped around a nail close to the bottom or a wooden plug may be slipped into place and fastened with two small staples. Another type is made of insulated copper wire. This is softer than iron wire, but has the advantage of being wrapped with a soft material which serves as padding.—Peter P. Roccapiore, Middletown, Conn.

When an extension cord must be moved from one position to another occasionally, it will be found convenient to attach a number of spring-type clothespins to the joists at intervals of about 6 ft.; these will hold the cord securely and allow its removal at any time without damage.

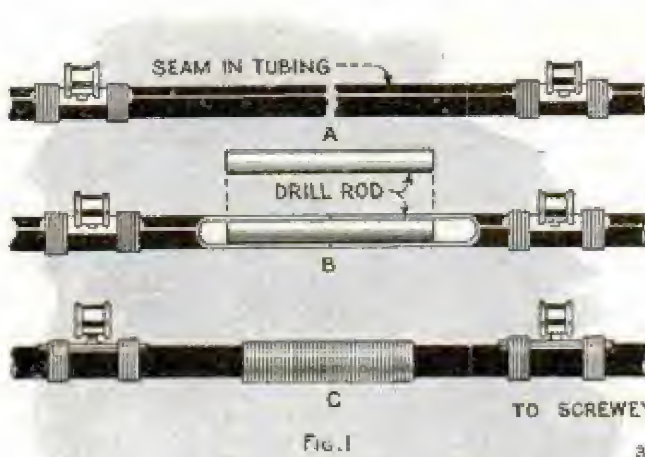


Fig. 1

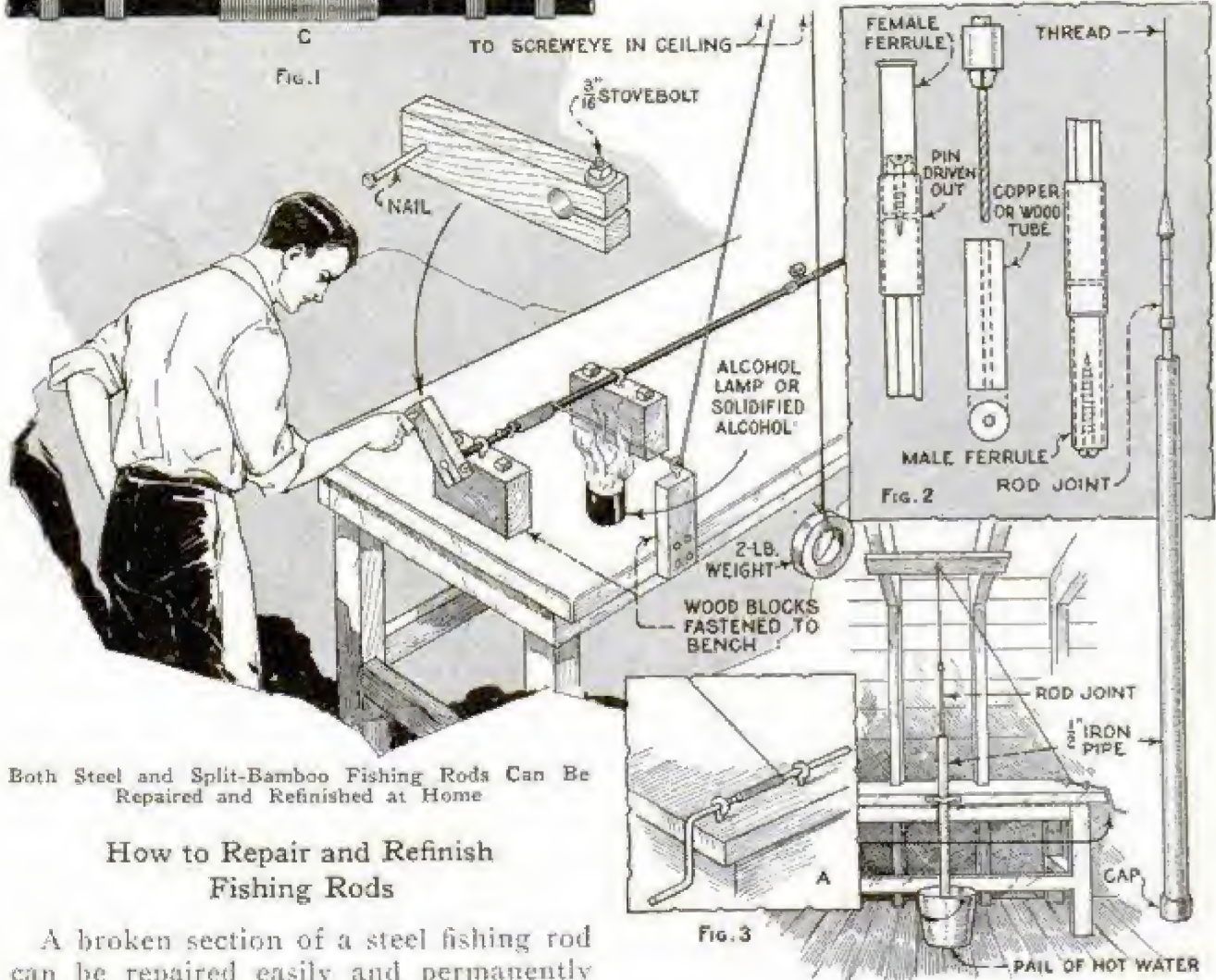


Fig. 2

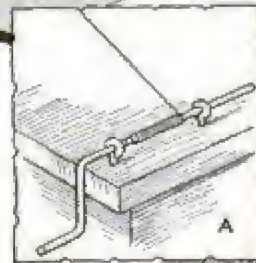


Fig. 3

Both Steel and Split-Bamboo Fishing Rods Can Be Repaired and Refinished at Home

How to Repair and Refinish Fishing Rods

A broken section of a steel fishing rod can be repaired easily and permanently by following the method shown in the illustration. First file the broken ends smooth and clean away the rust and scale from the inside of the steel tube for at least $\frac{3}{4}$ in., and remove the enamel from the outside for about $1\frac{1}{2}$ in. from the ends. Get a piece of drill rod, $1\frac{1}{2}$ in. long, which fits exactly inside of the tube without spreading the seam. The shank of a discarded drill can be used for this purpose. Sweat the drill rod inside of the tubing with solder. Now wrap the outside with copper wire, No. 26, 28 or 30 gauge, as shown in the lower drawing. Rig up the rod on the bench in the manner indicated, and run the wrapping wire

through a screweye in the ceiling and through another screwed into a block fastened on the bench opposite the break; hang a weight on the end of the wire. Fasten the end of the wire to the line guide nearest the break and make a few quick turns to bring the wire to the point where the close wrapping begins. If the wire is drawn through the flame of an

alcohol lamp or of canned heat, the contraction of the wire on cooling will assure a tight wrap on the rod. Wrap for about $\frac{3}{8}$ in. on each side of the break. While the strain is still on the wire, sweat the wire on the rod. When the solder has set, cut off the ends and smooth the job with emery cloth, after which enamel can be applied. Details A, B and C of Fig. 1 show a rod before, during and after the repair.

Frequently the ferrules on split-bamboo fishing rods, particularly of the casting variety, become loose. To reglue is only a temporary repair. A better method is

to expand the wood into the ferrules with wood screws, as shown in Fig. 2. To do this, it is necessary to drill a pilot hole for the screws. In case of the female ferrule, a bushing of copper tubing or hardwood should be used to center the drill. Before drilling, remove the crosspin with which most ferrules are originally fitted. In the male ferrule, drill the pilot hole of ample size so that the screw will not expand the ferrule itself. Should the ferrule loosen again, a slightly larger screw will immediately remedy the trouble.

Perhaps no article requires a better and more durable varnish job than a bait-casting rod. Not only is the rod dampened and dried off a dozen times in a day's use, but it is constantly bent and whipped, and the varnish is under perpetual strain. An even high-gloss coat can best be obtained by dipping the rod joints into the varnish. To do this, obtain a piece of $\frac{1}{2}$ -in. pipe, about $3\frac{1}{2}$ ft. long and capped at one end. Fill the pipe with high-grade spar varnish (1 pt. is enough) and place the pipe in a pail of hot water, as shown in the drawing. While the varnish is warming, rig up a miniature windlass with two screw-eyes and a piece of wire bent to form a crank, as shown in Fig. 3. Fasten one end of a length of thread to the windlass and pass the other end through a screw-eye driven into the ceiling directly above the pipe. When the varnish is nicely warmed insert one of the rod joints. The joint must be thoroughly clean, and a cork or wooden plug should be placed in the female ferrule. Both ferrules should be wrapped with paper to prevent contact with varnish. Attach the thread to the upper end of the rod joint and by means of the little windlass, slowly and evenly withdraw the joint from the varnish. The cohesion of the surface film of the varnish will draw all surplus varnish from the joint, leaving an even high-gloss finish.—Dick Cole, Los Angeles.



Inlaid Linoleum Used Instead of Tile for Wainscoting on Bathroom Wall; It Is Cheaper and Entirely Satisfactory

Linoleum Takes Place of Tile on Bathroom Walls

Inlaid linoleum was successfully used as a substitute for tile in the bathroom shown in the photo. A California contractor, who has made a number of such installations, finds that the linoleum can be glued directly to the lathing while a house is under construction, or to the plaster in case of houses already built. Wainscoting made of this material is much cheaper than tile, and has been found satisfactory in every way.—Mary Gleeson, San Francisco.

Holder for Ball of Twine

Two short pieces of rubber from an old inner tube, stretched over a ball of twine



and tacked down as shown in the photo, will be found entirely satisfactory as a twine holder if the regular article is not available. As the rubber

can be stretched, the twine can readily be removed and put back.—Frank W. Bentley, Jr., Missouri Valley, Iowa.

Kitchen Mechanics



COOKING done on a camp stove is not always certain in its results, owing to wind and other weather conditions outdoors. Much improvement will result from covering the stove with a hood made of asbestos cloth and cementing sheet asbestos on the inside, as shown in Figs. 1 and 2. This will reduce the radiation of heat, which is the cause of the trouble. It is an easy matter to calculate the size and lay out a pattern for the hood. The joining edges should be sewed with asbestos cord or copper wire. In the case of stoves that allow the use of inside lining without interference with folding, the material can be fastened with ordinary stove or furnace cement. After the lining is applied, let

SHEET ASBESTOS CEMENTED AND RIVETED ON INSIDE OF OVEN

STITCHED WITH ASBESTOS CORD OR SOFT COPPER WIRE

ASBESTOS-CLOTH COVERING

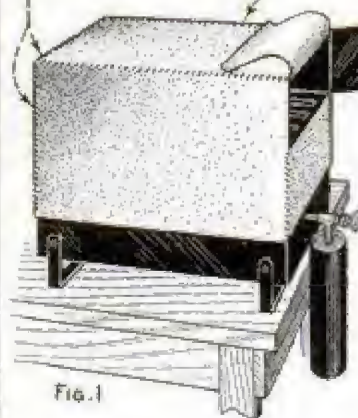


Fig. 1

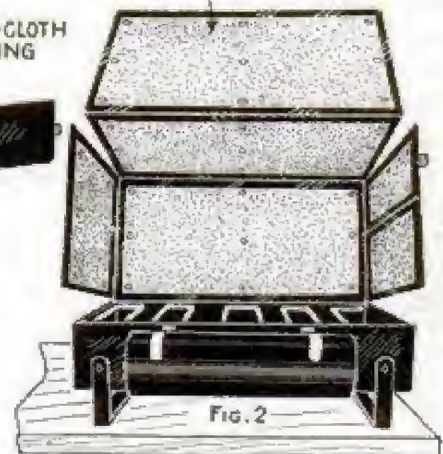


Fig. 2

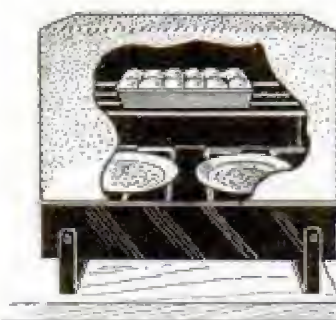


Fig. 3

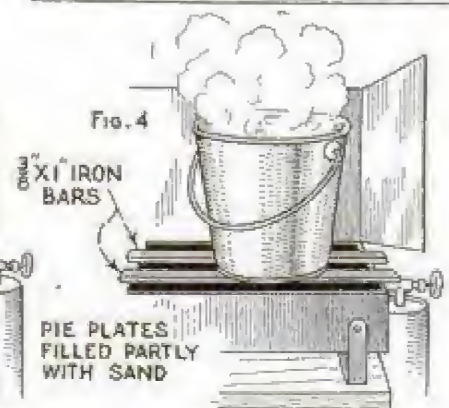


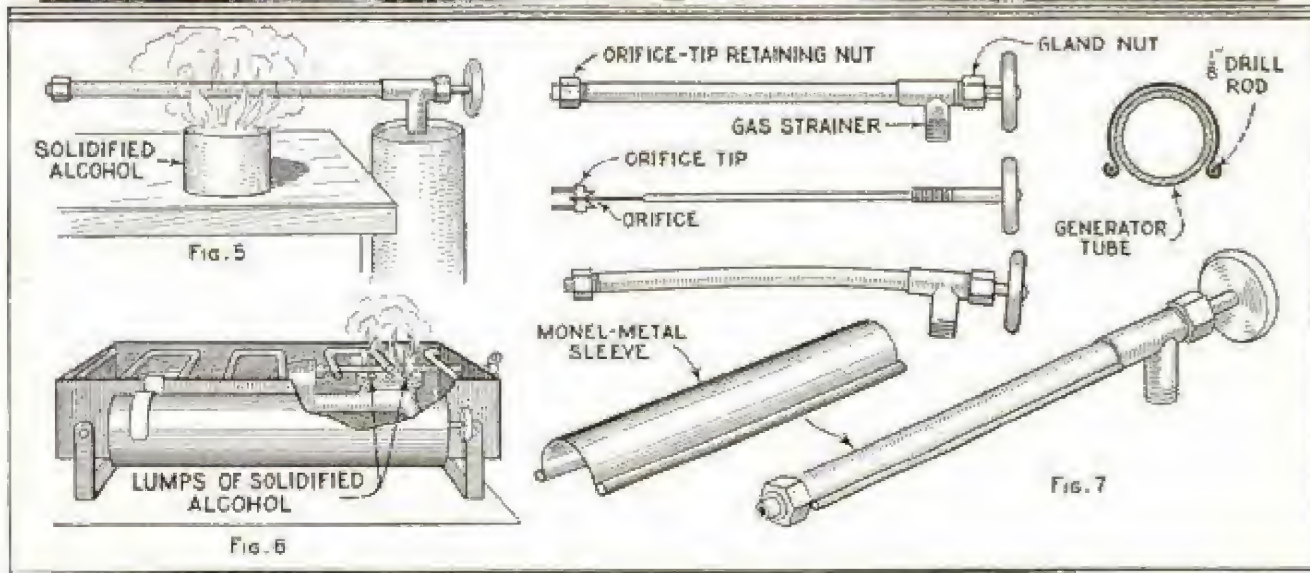
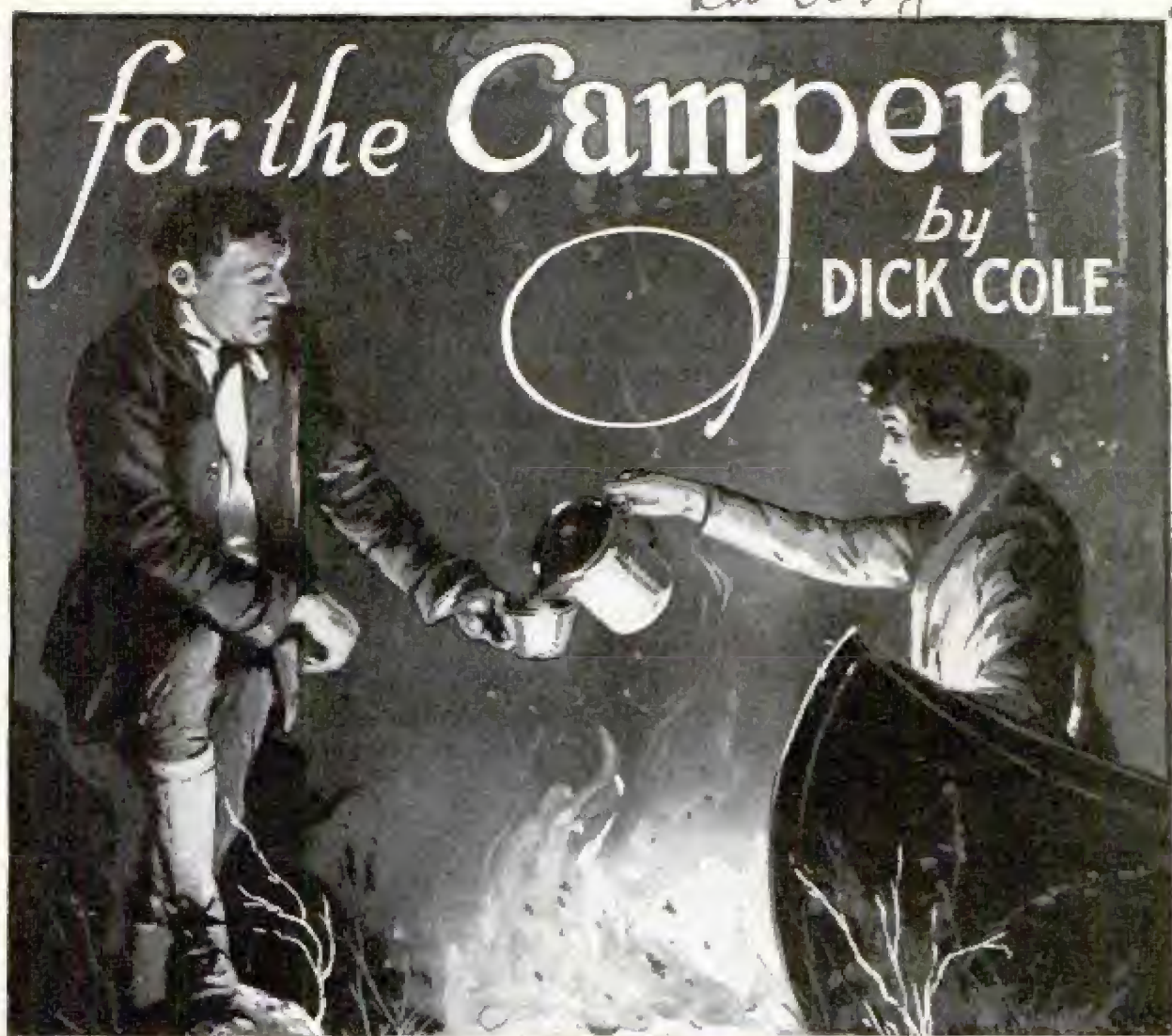
Fig. 4

ONE 1/2" IRON BARS

PIE PLATES FILLED PARTLY WITH SAND

the oven dry out thoroughly before using it. Much better baking can be done if tin plates (not aluminum), partly filled with dry sand, are placed in the oven over the burners. (Fig. 3) This distributes the heat more uniformly and helps to maintain a steady temperature. A pailful of water or a cooking utensil of considerable

Richard Cole, 233 E. 11th St. Los Angeles, Calif.



weight is likely to bend the grid. To prevent this, lay two 1 by $\frac{3}{8}$ -in. iron bars across the stove as in Fig. 4.

If he uses a gasoline stove, the camper will find solidified alcohol, commonly known as "canned heat," of considerable help for preheating the generator. Where there is a quickly detachable generator,

the method indicated in Fig. 5 can be used, but if the stove has no such unit, small pieces of canned heat may be placed on the priming cup and burned, Fig. 6.

Just as the carburetor is the heart of a gasoline engine, so the generator is the heart of a gasoline stove. Practically all troubles experienced with such a stove

are due to a faulty generator, and are often caused by the simple fact that the generator is bent. The generator tube is made of a copper-base alloy because of its high heat-conducting property, but it is also easily distorted by expansion and contraction so that it gradually becomes curved, as shown in the detail of Fig. 7. When this occurs, the tip on the needle valve is jammed or broken off, or, if it does enter the orifice, which is a very small hole in the end of the generator, it reams and burnishes this hole until it gets too large and dirty for good operation, with the result that the flame is smoky and dirty. The proper functioning of any camp stove depends on the accuracy of the orifice opening. If it is enlarged even a few thousandths of an inch, the mixture of gasoline will be too rich, and the flame will burn yellow and soot will be deposited on the cooking utensils. A positive method of overcoming the bending or buckling of the generator is shown in Fig. 7. A piece of No. 18 gauge monel metal is shaped to form a semicircular sleeve, covering about two-thirds of the generator. The edges are rolled over two lengths of $\frac{1}{8}$ -in. drill rod. The sleeve is made slightly smaller in diameter than the generator. To fit it in place, the orifice-tip retaining nut is removed, and the sleeve is pressed snugly over the tube. Of course, the exposed part of the generator should be next to the flame. Monel metal has a low coefficient of expansion and will withstand far greater heat without distorting than the generator. However it would not do to make the generator of this metal, for it is a comparatively poor conductor of heat and it would therefore take much longer to preheat it. The

use of a sleeve does not impair the heat conductivity of the generator. Monel metal can usually be obtained at a well-supplied hardware store.

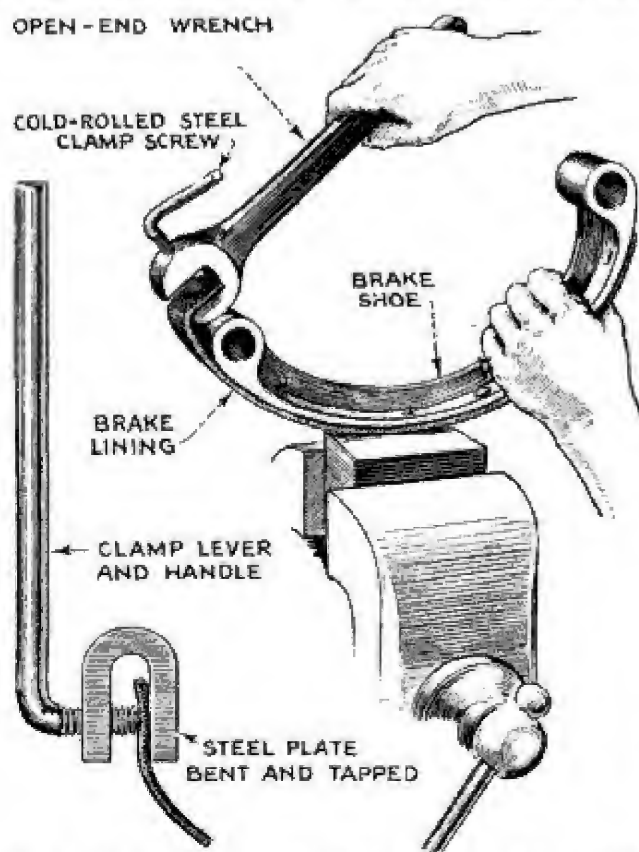
Papering Painted Walls

A painted wall or ceiling must be carefully prepared before applying wallpaper, to insure the adhesion of the paper. The surface must be scrubbed with soapsuds and then thoroughly rinsed and dried. The paste used on the paper should not contain any alum. To a pailful of paste add three sheets of isinglass, dissolved in 1 pt. of hot water, and then 2 oz. of glycerin. This paste will stick.

Handy Brake-Lining Wrench

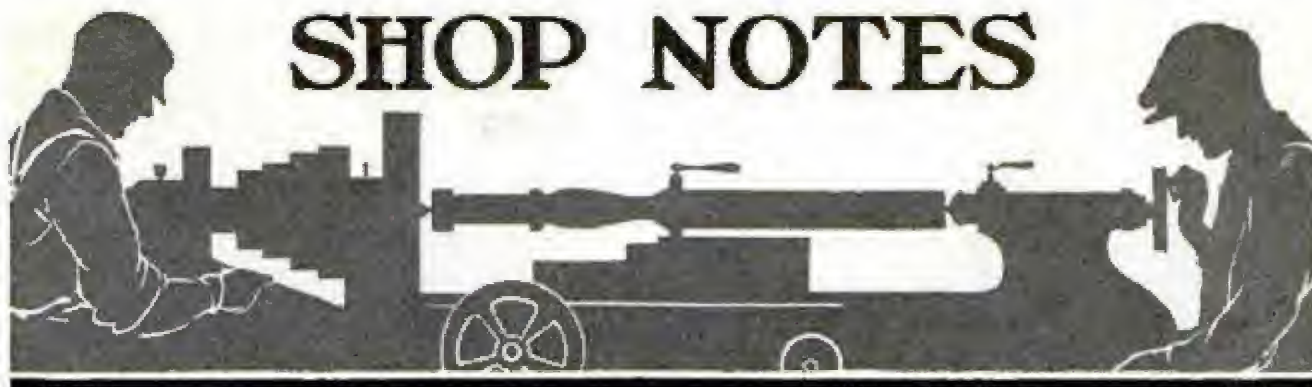
The fitting of new lining, on the brake shoes of four-wheel brakes of the internal expanding type, should be done with the lining tight against the shoes. This is essential, as it is almost impossible to equalize the brakes when the lining is improperly attached. A simple tool for stretching the brake lining tight on the drum is shown in the drawing. It consists of an open-end wrench, drilled and tapped

for a cold-rolled-steel clamp screw, as indicated. The lining is first attached to one end of the shoe with rivets and the wrench is then clamped at the other end of the lining. By drawing the wrench over the end of the shoe, the lining will be pulled taut. The tool can also be made from a strip of steel plate, as shown at the left. —G. A. Luers, Washington, D. C.



Brake Lining Can Be Held Taut against Shoe with This Easily Made Tool

☛ To clean felt hats, take a clean, dry rubber sponge, and rub it over the surface.



SHOP NOTES

All Shop Notes published in 1928, in book form—Fifty Cents—from our Book Department

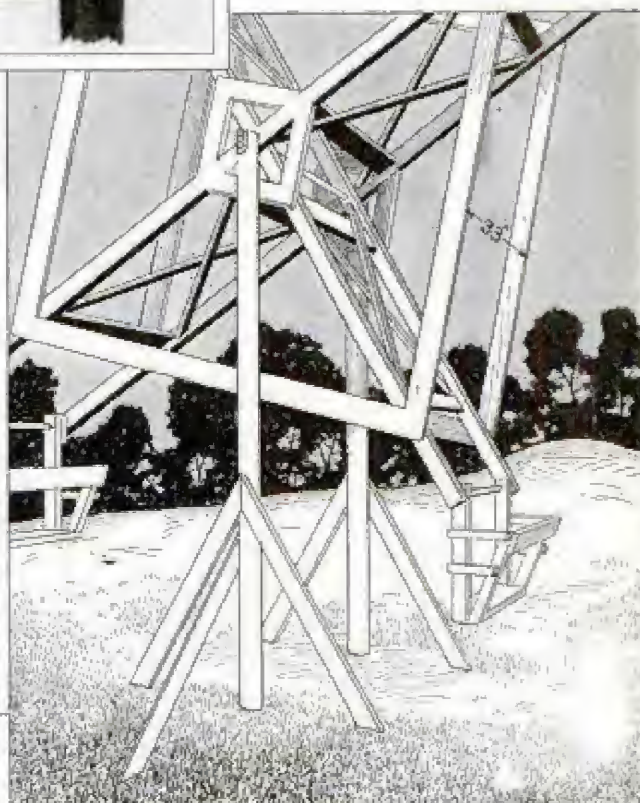
A Back-Yard Ferris Wheel

By R. C. BRADBURY

ALL the fun of the fair is guaranteed to the youngsters if Dad constructs in the back yard the Ferris wheel shown in the illustrations, and the youngsters are not the only ones who will like to ride either. The total cost of this wheel was less than five dollars.

The construction is comparatively

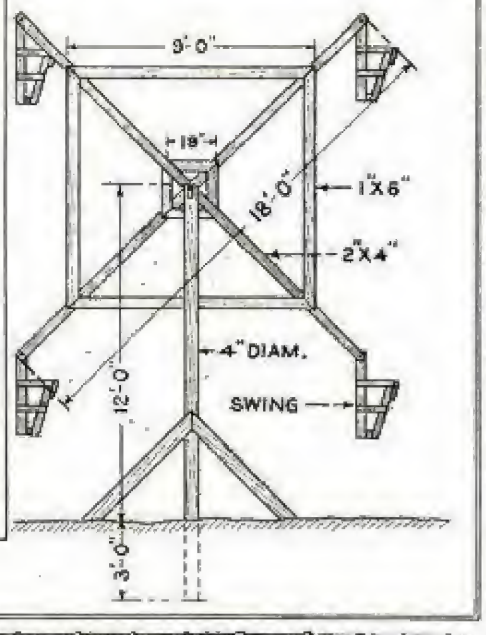
simple, although care must be taken, of course, to make all joints and members amply strong, and, if the installation is to last for a few years, to paint the structure thoroughly, to guard against deterioration through weathering. The over-all diameter of the "wheel" is 18 ft. and the width 2 ft. 9 in. The two-by-fours forming the arms of the wheel are crossed at the center, and braced near the hub by short pieces of the same stock, as shown. The longer



A "Kick-Power" Ferris Wheel for the Back Yard That Will Give the Youngsters All the Thrills of the Real Carnival Wheel



Note Block inside the Crossarm to Provide Clearance for the Seat



braces, forming the square near the outer ends of the arms, are of 1 by 6-in. stuff, 9 ft. long. Each set of arms being nailed together and braced, they are connected together by cross braces or bridging of 2 by 2-in. stock, 2 ft. 4 $\frac{3}{4}$ in. long, running across from arm to arm at the inner and outer braces. The assembly is further strengthened by 2 by 2-in. bridging, forming a cross between each pair of arms, and finally tied together by means of the $\frac{5}{8}$ -in. rods on which the seats swing, which are threaded at each end and fitted with nuts and washers. These rods are 2 ft. 10 $\frac{1}{2}$ in. long. The length of the swing seats is 25 in., their width 12 in. and, at the top of the swing arms, 17 in. The construction and suspension of the seats are shown quite clearly in the photos.

Before putting the wheel together, bore a 1 $\frac{3}{8}$ -in. hole in the center of each of the 2 by 4-in. crossarms. Then file out four malleable-iron washers to fit a 1-in. pipe, and drill them, near the edge, for $\frac{1}{4}$ -in. bolts, keeping the holes in line. Nail each pair of two-by-fours together, place a washer on each side, drill the crossmembers and bolt together with $\frac{1}{4}$ -in. bolts, running through the members and the washers. The bolts hold the assembly firmly together, and the washers form the bearing on the 1-in. pipe axle. A $\frac{1}{2}$ -in. hole is drilled at an angle through the joint of

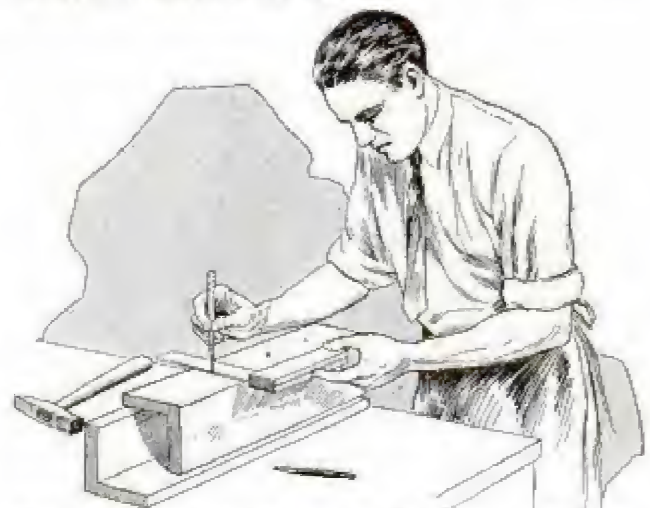
the crossmembers, down to the axle hole, and a $\frac{1}{4}$ by 4-in. pipe nipple driven in almost to the center hole. A grease cup, screwed in a coupling on the end of the nipple, on each side, serves to lubricate the bearing.

To fasten the pipe axle firmly in the tops of the 4-in. posts, a slot, wide enough to take the pipe, is cut in each post, and the axle dropped into place. Now, on each side, a piece of $\frac{1}{4}$ by 1 $\frac{1}{4}$ -in. flat iron, 14 in. long, is bent U-shaped to fit over the pipe. The legs of the "U" are given a half twist, and are drilled and fastened to the side of

the post with $\frac{1}{2}$ by 6-in. lagscrews. The wheel should be loaded so as to be in balance, although it is not necessary that all the passengers be of equal weight, as long as the heavier ones are seated on opposite sides.

Marking and Center-Punching Angle Iron

To mark and center-punch angle iron without the use of a vise is quite a difficult job. The accompanying drawing shows a method that has been found satisfactory when a vise is not available. The angle iron can be kept flat and measurements scribed without any difficulty.—Arthur W. Truett, Buffalo, N. Y.



Marking and Center-Punching Angle Iron When a Vise Is Not Available

Using Antimony in Making Patterns

When making patterns allowance should always be made for the contraction of castings in cooling. Where many patterns of the same kind are needed, as in small work, it would be convenient to make duplicates by casting from a single first pattern, if it were not for the double shrinkage that had to be allowed for. By making these duplicates out of a mixture of white metals containing 10 per cent or more of antimony the original size will be maintained. Antimony is of no use in any composition except to harden and to fill out. It does not mix when melted but remains suspended in granular form. Bismuth is also sometimes used for simple alloys. Bismuth goes antimony one better in that it expands with cooling. An interesting and valuable point about bismuth is the low melting point obtained when it is used in certain alloys. For instance, an alloy of bismuth, tin and lead will melt in boiling water.—Donald A. Hampson, Middletown, N. Y.

Holding Light Work in a Heavy Vise



Trying to hold small, narrow work in the jaws of a large vise is a rather difficult task. However, when a large vise is all you have, the following method will overcome the difficulty: Lay a small block or flat piece of wood on the vise jaws and slip two piston rings over the wood and between the jaws, as indicated. The work can then be pinched between the rings. Several turns of string around the lower portion of one ring will make them pinch together squarely when the jaws of the vise are tightly closed.

❶ No difficulty will be had in starting a cap on the gas tank or radiator, if it is turned backward until it moves smoothly and on a level.



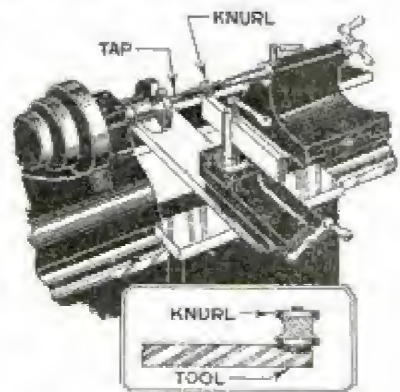
Pad Made from Old Inner Tube Protects Gardener's Knees from Mud and Moisture

Knee Protector for the Home Gardener

A neat and practical knee protector for the home gardener can be quickly made from part of an old inner tube. Cut off a piece about 8 or 10 in. long, and remove the upper portion, leaving only a very light band at each end, as shown in the detail. The pad will not be too tight when stretched over the knee and will prevent getting the trousers wet and muddy.—F. W. Bentley, Jr., Missouri Valley, Iowa.

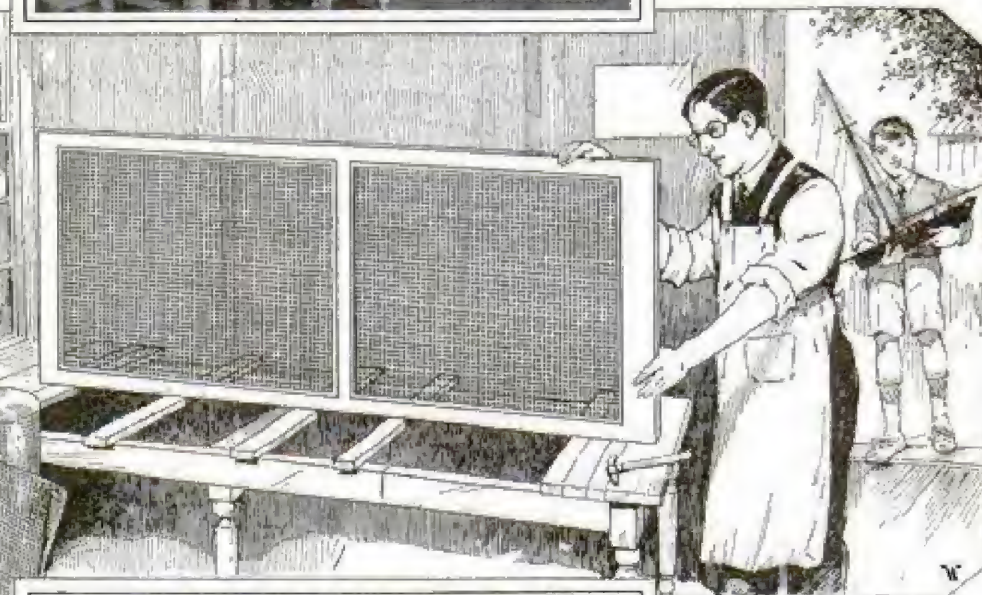
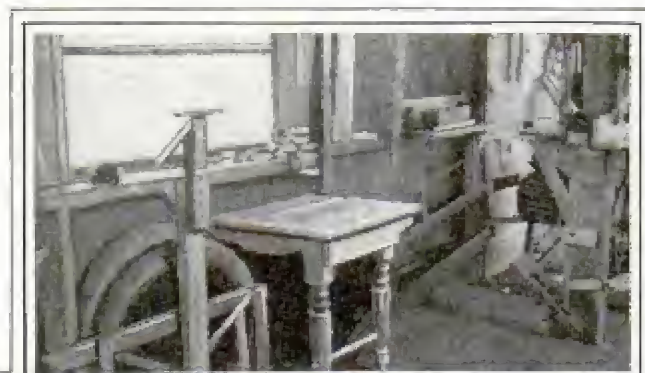
Making Concave Knurls

A concave knurl is an expensive piece to make if a milling machine is used to cut the teeth. I have devised a method that is much cheaper and just as satisfactory for my work. It is as follows: A tap, with a fine thread about the right size, is placed in a lathe as shown. The knurl is fastened to a holder, which is placed in the tool post. The lathe is started and the teeth in the knurl are cut just about the same as a hob cuts teeth in wormwheels.—Chas. Kugler, Philadelphia, Pa.



Assembling Screen Doors

Here is a folding bench for the small workshop. When closed, it occupies a space of only 18 by 30 in., but when opened, is nearly 9 ft. in length. It has been found especially handy for assembling screen doors, although it lends itself to many other uses. The



sliding units were taken from an old table having six legs. The two legs at one end were removed and this end was nailed to the wall under a window, as shown. Across each sliding unit, a 1 by 3-in. strip was nailed to provide suitable support for the work.



Folding Bench for the Small Workshop Especially Useful for Holding Long Work, Such as Screen Doors

Care of Oil-Soaked Waste and Rags

The danger of spontaneous combustion from rags or waste saturated with oil in shops, garages and residences is not sufficiently understood. This is, no doubt, because most people do not know that linseed oil will oxidize rapidly and, if cotton is soaked with oil, enough heat will be generated in a short time to char the cot-

ton. The addition of red lead seems to make the heating more rapid, as pipe fitters have frequently observed. It is a common thing for these men to clean the red lead and oil from a new joint by wiping it with a handful of waste. It is also common for the workman to carry the waste in his pocket. A pipe fitter once felt a hot spot against his

body, which caused him to investigate his pocket, with the result that he found a pocket lining burned out and a mass of charred waste. If this jacket had been hung in the clothes closet at

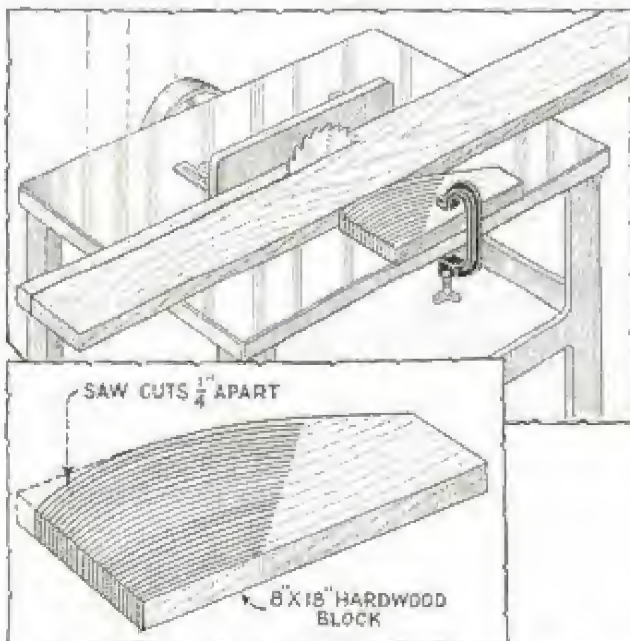
home, a burned dwelling might have resulted, with the origin of the fire a mystery. The safe thing to do is never to put oil-soaked rags away. Either burn or wash them at once. In mills, power stations, shops, garages, etc., where there is a quantity of oil-soaked waste, cans should be provided to receive the discarded waste. The cans should be made of heavy sheet metal with riveted seams, and with iron legs to hold them several inches from the floor. Use a tight-fitting metal cover.—F. W. Bradly, Scranton, Pa.

Hardening Steel

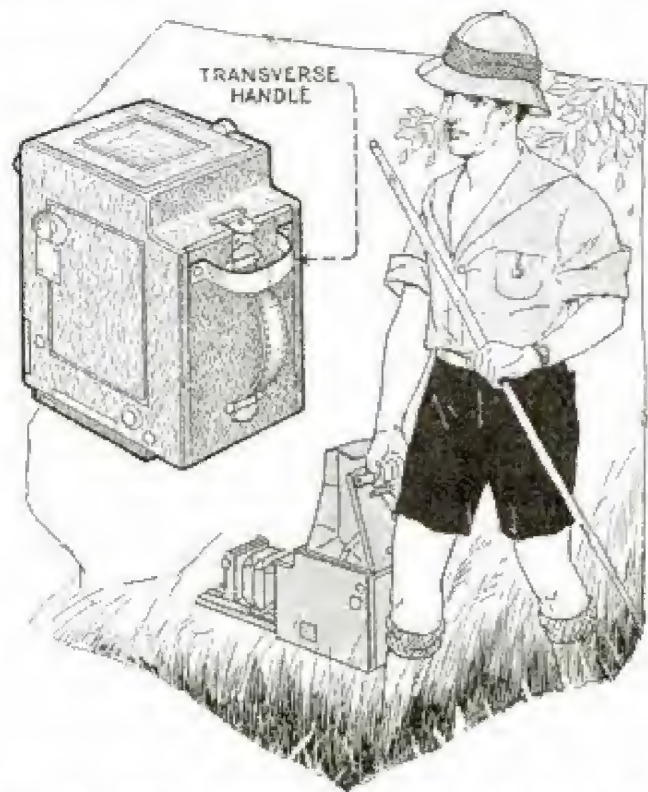
Hardening steels is a simple process of heating and quenching. As long as a steel has over one-half per cent of carbon in it, it can be hardened. This is accompanied by a brittleness that makes it impossible to bend or draw out the steel. Wrought iron cannot be hardened; it is very soft and ductile. There is also a steel that matches this ductility. Steel with more than 11 per cent of manganese in it refuses to get brittle when it is quenched from the hardening temperatures. On the contrary, it becomes ductile and can be drawn into wire. But although ductile, it cannot be cut with ordinary tools but must be ground.

Spring Guide for Bench Saw

Although nearly all bench or table saws are fitted with a back guide, this often does not guide long boards accurately when these are sawed into strips, a common practice in joining and woodworking shops. The trouble is due to the inability of the worker to keep the board against the guide. To remedy this, provide an additional guide on the other side of the saw table, as shown in the drawing. The extra guide consists of an 8 by 18-in. piece of straight-grained hardwood in which a number of saw slots are cut about $\frac{1}{4}$ in. apart, as indicated, to form a spring.—H. C. Stevens, East Boothbay, Me.



Additional Guide on Saw Table Helps Worker Saw Long Boards into Strips



Extra Handle Arranged Transversely on Reflecting Camera for Carrying It When Open

Transverse Handle on Reflecting Camera

Quite frequently users of reflecting cameras have occasion to take a number of photos in succession, and it would then be a great convenience to carry the camera from place to place without closing it. This is made possible by providing a transverse handle as shown in the drawing. To carry the open camera by the original handle, two fingers must be slipped through the upper end, and this is not only unhandy but very tiring, especially if the camera is heavy. The transverse handle remedies both troubles.—John Edwin Hoag, Honolulu, H. T.

Sulphur Sets Rods and Bolts in Concrete

For setting rods and bolts in position in holes drilled in stone and concrete, melted sulphur is often used. Although it would seem that lead would be better for this purpose, it contracts upon cooling and would therefore not be tight in the hole. Similarly, iron and brass cannot be used for jobs of this kind. The writer knows of some iron fence posts that were set in sulphur something like 30 years ago and are fully as tight today as they were when first placed.—Donald A. Hampson, Middletown, N. Y.

How to Finish



Lacquer is a strictly modern finish, characterized by its soft, subdued luster. It is easily kept in good condition, and, when it does become dingy, can easily be rubbed to a brighter finish with a soft cloth. It may also be waxed, if desired, producing a beautiful effect. Brushing lacquer, of course, is the type especially adapted to the home decorator. It dries in a few minutes, so that the furniture may be used within a very short time after the lacquering has been done. No

elaborate preparation of the surface or long-drawn-out undercoating is necessary. Good-looking work can be done by simply brushing a couple of coats onto the surface, starting the second coat as soon as finished with the first one. However, there are some principles in the application of brushing lacquer that will aid in the obtaining of the finest possible finish, and assure consistent results.

First, prepare the surface. While no extensive work is required, a little time spent in put-

THE new trend in styles has given the home craftsman an opportunity to have the very latest in furniture, and at the same time save an appreciable amount in furnishing his home. This furniture, with its straight lines and sharp angles, is easily made at home with ordinary tools and from material available from any lumber yard. Unpainted furniture is also sold by stores to be finished and decorated at home.

The finishing of unpainted furniture, starting with the bare wood, is therefore of special interest now. A description of some of the finishes most in vogue, with instructions for producing them, follows.



New Wood Must Be Sanded with the Grain to Make the Surface Ready for the Finish



Unpainted Furniture

by Berton Elliot



ting the surface in good condition will usually save at least one coat of lacquer, produce a better job and insure freedom from troubles sometimes encountered when no preparation of the surface is attempted. Fill all cracks, holes and surface imperfections with plastic wood, or a mixture of fine sawdust, whiting and shellac or lacquer. Then sandpaper the entire surface to platelike smoothness with No. 00 sandpaper, since practically no lumber or unpainted furniture is sanded at the mill to a suitable finish.

Next apply a thin coat of pure white shellac, allow it to dry thoroughly for one or two hours, then sandpaper to absolute smoothness



again. Most woods made up into unpainted furniture, such as poplar and whitewood, are soft and porous, and would absorb a first coat of lacquer like blotting paper. Even

the second coat soaks largely into the surface, so that, if shellac were not used, four coats of lacquer would be necessary for a good job in many cases. The shellac acts as a sealer, causing the first lacquer coat to stand on the surface of the work instead of sinking into it, and a two-coat job over shellac generally has a splendid luster. The second function of the shellac is this:



In Enameling New Wood, Some Turpentine Should Always Be Added to the First Coat, to Aid It in Penetrating the Wood

The grain of most woods is raised when wet with painting materials, so that a fuzz covers the entire surface. When sanding down the shellac coat, this fuzz is taken



off and does not appear again with subsequent coats. Finally dust off all loose particles of sand. Be sure the surface is absolutely dustfree before applying the lacquer, also that it is thoroughly dry and free from grease. Work in a dustfree place, and take care that no dust settles on the work before the lacquer dries.



Be sure your brush is clean, as disfiguring specks of dirt on the finished work often come from a dirty brush. Use a soft-hair brush, preferably a fitch or bear-hair, and remember that a new brush has always some dust and loose hairs in it which should be worked out before using. Apply the lacquer with a full brush and in long strokes, brushing as little as possible. Just flow it on and let it alone. Watch out for loose hairs shed into the work as you go along, and, if one is seen, poke it out immediately with the corner of the brush. Work quickly but carefully. In case the lacquer becomes roughened in any place through brushing it after it has started to set, smooth it out by going over the place with a fresh brushful of lacquer, or by

dipping the brush into lacquer thinner and brushing deftly over the roughened surface, which will dissolve the lacquer and cause it to run together again. Do not sandpaper between coats. Unless one is expert, it is difficult to sand lacquer satisfactorily, and the nature of the material is such that each coat levels itself to a perfectly smooth, even surface, so that sanding, as far as ordinary work is concerned, is unnecessary.

Two or more coats of lacquer should be applied, as necessary. If attractive colors are selected, and spottings, jewels and stripes of the trim color tastefully located, the piece will appear fully finished without further decoration. If an additional finishing is desired, it may be done with transfer patterns or stencils, which are now available in modern designs, so that the decoration may be in keeping with the spirit of the furniture.

Enamel is another modern finish, the porcelain-like luster of which is preferred by many to the more subdued tones of lacquer, and a workmanlike job of enameling is really something worthy of admiration. In enameling, the preparatory work is the same as for lac-



A First Coat of Shellac on Work to Be Lacquered Seals the Surface and Saves an Extra Coat of Lacquer



quering, except that no shellac is used. It is even more important with enamel to see that no dust settles on the work when it is wet, on account of the longer time the enamel takes to dry. Where practicable, it is advisable to provide some sort of cover, for example, by placing a couple of sticks across two chairs, and laying newspapers over the sticks. Underneath this arrangement the articles may be placed while drying.

Enamel differs from lacquer in that the finish is built up in a series of steps, the procedure, however, being very simple. Apply a coat of flat enamel undercoater. Allow this to dry 24 hours, then sand it to remove the brush marks and to level off the surface. Dust clean. Next apply a coat made of half undercoater and half enamel mixed, allow this to dry 48 hours, sand smooth and dust clean. Finally apply a third coat of straight enamel,



Open-Grain Work to Be Finished with Varnish Should Be Filled with a Paste Filler, Brushed On, and Wiped Off across the Grain

ing tightly sealed, it should be strained through several thicknesses of cheesecloth before it is used.

A three-coat job, as described above, should produce a first-class finish with any of the brighter or stronger colors. With white, ivory and the lighter tints, a four-coat job is always so much better as to be well worth while. In these cases, two coats of flat undercoater should be applied,

followed by a coat of the half-and-half mixture and a final coat of straight enamel. If it should be found that solid covering of the surface has not been obtained after the final coat, due to inexperience or to some unusual condition of the surface, sandpaper the final coat when thoroughly dry (not under 48 hours), dust clean and apply another coat of straight enamel.

For the flat coats, regular enamel undercoater may be obtained at all paint stores, but in white only. White lead,



flowing it on, and taking extreme care that no dust gets into it, either from the brush or from the room. If the enamel used has been standing without be-

thinned with flattening oil, is also very satisfactory, but not so convenient for the amateur to use. Flat wall paint makes a splendid undercoating, and may be obtained in colors approximating the color of the enamel, making it more easily covered with the finishing coats.

When enameling new wood, the first coat should carry more thinner than the first coat over previously finished surfaces, in order to satisfy the absorption of the wood and still have enough liquid left over to bind the paint film firmly to the wood. If enough thinner is not used, the film may chip off later.

Enamel may be rubbed with pumice-stone and rubbing oil to a semidull effect, sometimes known as a hand-rubbed finish. It may also be enriched with stencil and transfer, in the same manner as lacquer.

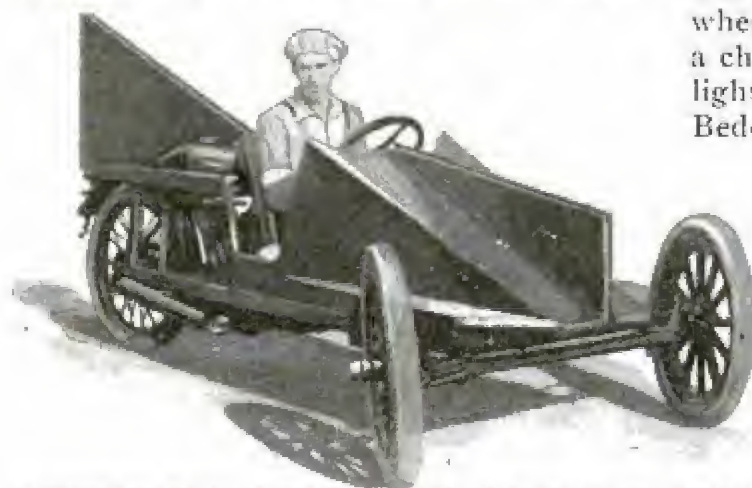
Natural and stained-wood finishes are at present enjoying renewed popularity, and some beautiful effects may be obtained by finishing novelty furniture with suitable transfer decoration, using the larger and more open designs extending over a considerable part of the surface, and in colors to blend in with the wood, rather than the mass design, contrasting with the background employed for enamel and lacquer in solid colors.

For the natural finish, sand the surface and dust clean. If the wood is soft and close-grained, apply a very thin coat of white shellac (ordinary "four-pound cut" commercial shellac reduced with an equal amount of alcohol). Sand down well. If the wood is of the open-grain type, such as oak, mahogany, walnut, etc., the pores must be filled with a paste wood filler (natural), instead of the shellac, applied with a brush and wiped off with a coarse cloth, against the grain. Allow the filler to dry, then finish with two or three coats of high-grade interior-finishing varnish, sanding lightly between coats and allowing each coat at least 48 hours to dry. The last coat may be flat or semidull varnish, or it may be rubbed down with pumice-stone and oil, as desired. The stain finish requires only two more operations than the natural finish, otherwise the steps are the same. After the wood is sanded, apply a coat of oil stain, for soft wood, or penetrating stain for hard woods. Next, apply paste wood filler, if an open-grain wood, colored to correspond to the stain used. Follow with a coat of pure shellac to seal the stain, using white shellac for the lighter finishes and orange shellac for such woods as dark mahogany. Finish with varnish as for the natural effect.

Homemade Racer Has Novel Features

A novel racing car, built by J. S. Eastham, of Cottage Grove, Oreg., weighs only 465 lb. Ordinarily, such a light car would not be able to hold the road when traveling at a high rate of speed, but the special design of the hood, which slopes

downward, overcomes this trouble. The reason is that the air exerts a downward pressure on the hood. The two rudder-like projections on the hood and rear also help to steady the car, preventing it from skidding on sharp turns at high speed. Instead of having two drivewheels and a differential, this car has only one rear wheel, taken from an old motorcycle, and a chain drive. This arrangement is much lighter than a two-wheel drive.—Elbert Bede, Cottage Grove, Oreg.



Lightweight Racing Car Has Specially Designed Body to Hold It to the Road at High Speed

Renovating Pearls

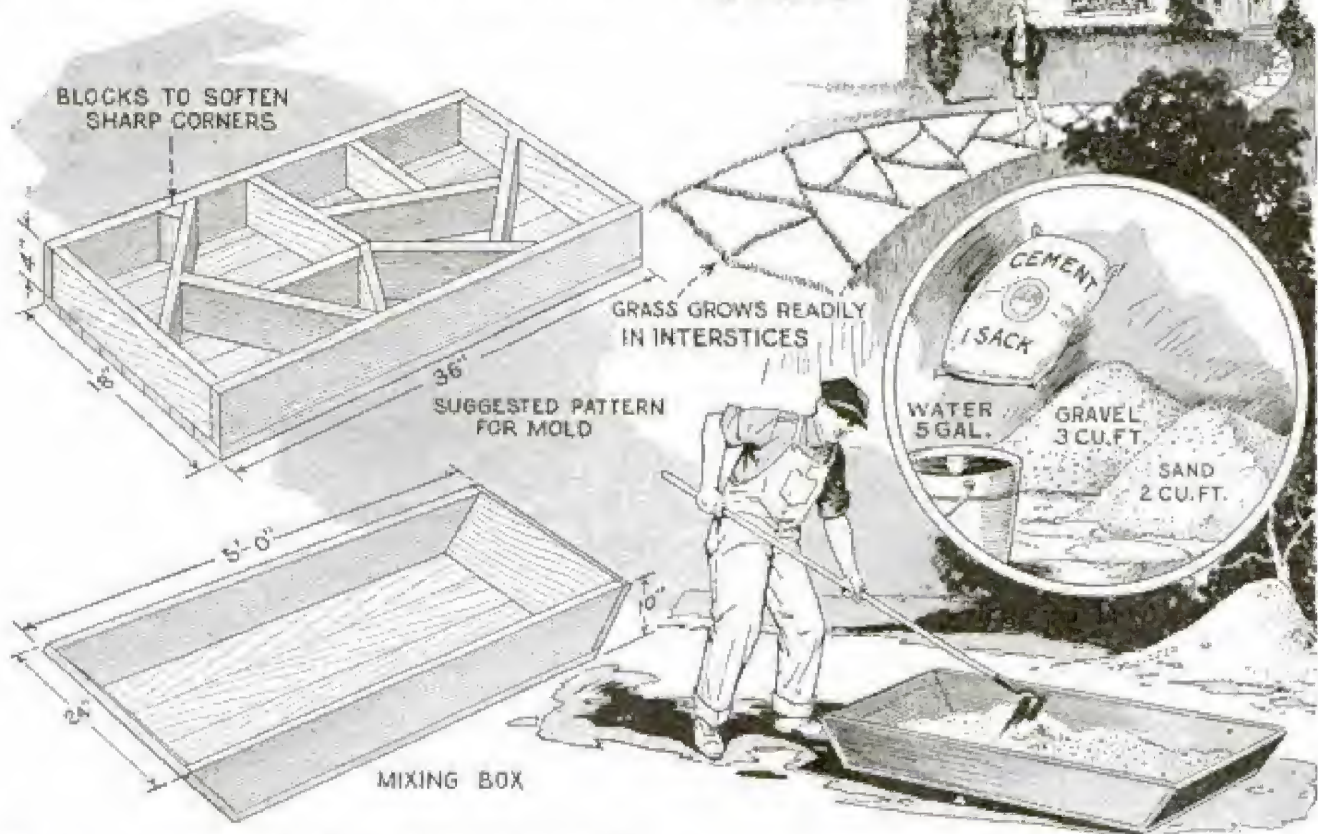
When pearls have lost their luster, simply coat them with a thin film of liquid finger-nail polish, allow it to dry thoroughly, and the luster will be restored and will last indefinitely. Nail polishes come in tints from pearl gray to deep pink.

Making Concrete "Flagstones"

Unquestionably the flagstone path is more fitting for the small house than the formal cement sidewalk. Certainly it is more attractive, and is in universal favor with landscape architects. Flagstones of concrete in picturesque, irregular patterns can be made easily by the home owner.

notes streaks of unmixed cement; brown, quantities of sand without cement. Add the water gradually while mixing. The

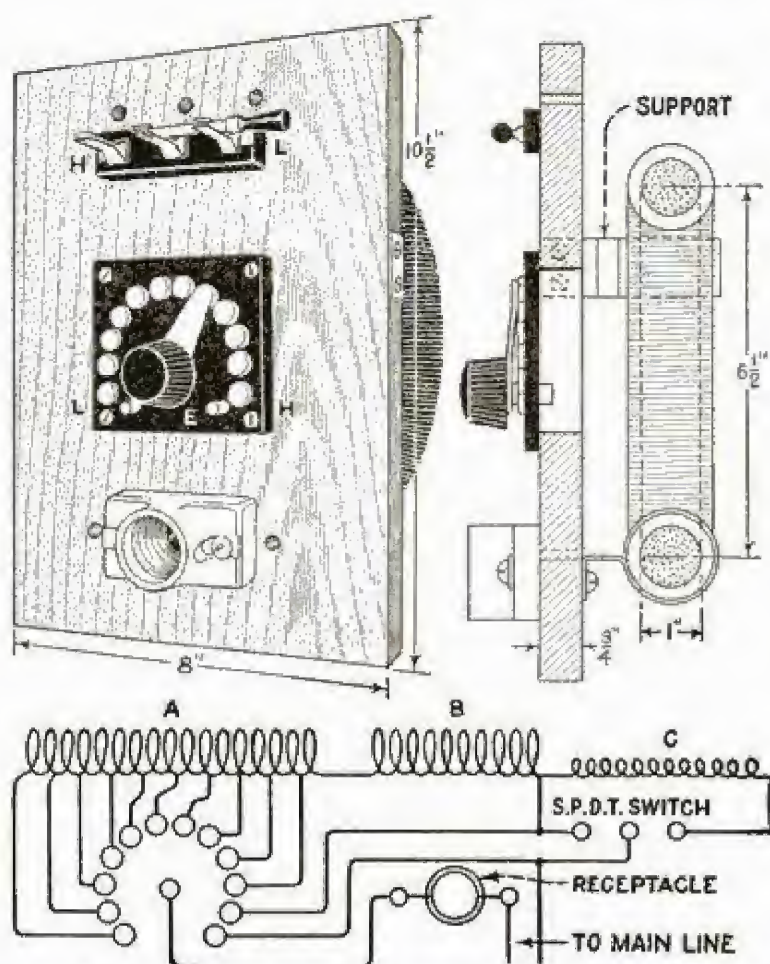
Making Concrete "Flagstones" for the Garden Walk Is an Easy Job for the Amateur Mechanic. If the Method Shown Is Followed



First make a mold of the approximate dimensions given, with a number of irregularly shaped compartments, of a design to suit your individual taste. By no means, however, make them in regular geometric patterns, for they will then deceive no one as to their origin. The odd sizes and shapes imitate flat stones just as they are picked up in field or quarry. Mixing the cement or concrete is much simpler than the uninitiated might think. A mixing box will greatly simplify the work, preventing the mass from slopping over as on a mixing platform. For work of this nature, mix about 2 cu. ft. of sand, 3 cu. ft. of fine gravel and 5 gal. of water to one sack of Portland cement. If the sand and gravel are very dry, use about 6 gal. of water; on the other hand, if they are very wet, use 4 gal. Before adding the water, however, the sand, gravel and cement should be turned over and over until the mix is of a uniform color. Gray de-

compartments of the mold should be oiled before filling with concrete. Discarded crankcase oil will serve the purpose. Fill the molds, tamp well into the corners, and allow the concrete to set for two or three days before removing. In the meantime, keep it moist by placing wet gunnysacks over the top. When the blocks are removed, a new set can be molded, until a sufficient number are completed to make your path. Take care that there are no hollows in the blocks; it is better that they be slightly crowned so they will always be dry after a rain. They should be set in the ground slightly above the sod level. The interstices between the blocks are filled with rich soil and seeded. In due time, you will have a most attractive grass-grown path through your garden.

☛ Gas-stove burners may be cleaned by boiling in a strong solution of washing soda and water, then rinsing and drying.



Tapped Choke Coil Permits Accurate Control of Small Electric Crucible; Diagram Shows Taps and Connections

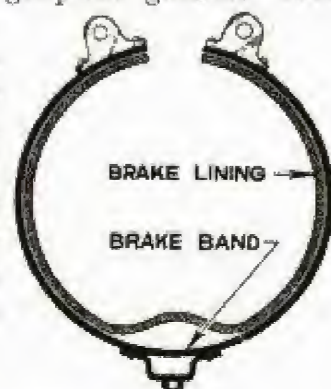
Choke Coil Controls Electric Crucible

In the January, 1928, issue of *Popular Mechanics* an article was published describing the construction of a small electric crucible. In connection with this, I made a choke coil to regulate the heating of the element. The crucible with the choke-coil control has been found very handy for heating test tubes in analytical-chemistry work, to ignite precipitates not requiring a blast lamp, and those that are easily fused, such as silver chloride. The materials required are 1 wooden panel, 8 by 10½ by ¾ in.; 1 single-pole, double-throw knife switch; 1 radio inductance switch with 12 points and 2 stops, mounted on a piece of bakelite; 1 cleat receptacle; 75 ft. of No. 18 copper bell wire and 125 ft. of No. 22 insulated-copper wire for making the coil; 3 brackets of 1-in. strap iron for supporting the coil; glass tubing for insulating the coil from the panel, and some screws. Also get some soft-iron wire such as stovepipe wire for the core. Wind the iron wire to form a small coil, about 6½ in. in diameter, as shown in the

detail at the right, wrap friction tape around the core thus formed and wind the bell wire around it, taking care that adjacent turns of the wire do not touch each other. Ten taps are taken off the first section of this winding at 7-ft. intervals, as indicated at A in the diagram. Continue winding the bell wire to form the second section, B, which is untapped except at the end. To the end of the bell wire attach the No. 22 wire and continue the winding as at C. All connections to switch points, receptacle and switch are indicated in the diagram. The use of the double-throw switch gives the 12-point inductance switch the capacity of 24 points.—Frank E. Gray, Ogden, Utah.

Useful Brake-Lining Kink

The customary practice of replacing a brake lining is to cut it a little longer than the inner circumference of the brake band, ¼ in. for every 10 in. of length being the usual allowance. The lining is then buckled in the center and the ends riveted, whereupon the buckle is pressed down against the band. With this method a smooth surface cannot always be obtained at this point because friction against the brake band has prevented the lining from spreading out evenly toward the riveted ends. This can, however, be avoided by coating the surface of the lining and band with graphite grease. Not only does this allow the lining to conform better to the band but prevents the formation of rust, which is destructive to the band and lining alike.—Richard P. Cole, Paterson, New Jersey.



☛ A section of a bandsaw, or an old hacksaw blade, bent in the form of a "U" having its two ends fastened to a wooden handle, makes a good weed-cutting hoe.

Making a Disk Sander

By W. C. LAMMEY

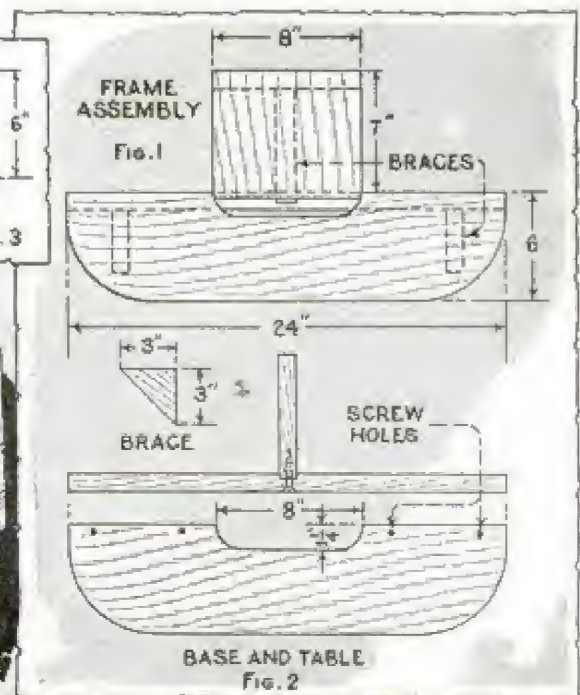
FOR smoothing and truing up small parts of furniture, and for a clean finish on the end grain, as well as smoothing short pieces of stock, a small sand disk has no equal. In fact, it is about the only effective smoothing and finishing medium driven by power the home worker has at his command.

The possibilities of a sand disk are determined by the size of the disk, the power, and the size of the table on which the work is supported. Where a wide range of work must be surfaced and edged, the table must be large enough to support it effectively. With an 8-in. disk and medium-grit paper, it is possible, with a framework and a suitable fence and supporting table, to surface work up to 14 or 15 in. wide and do an excellent job. For edging and smoothing end grain, the sand disk, aided by a supporting table of sufficient size, has no equal.

The arrangement shown in the illustration

tions has been found to be most effective for handling such a range of work as the individual worker is likely to have. Mounted in this way, the disk will surface or edge with equal facility and at a speed and ease which puts hand sanding out of consideration entirely. Driven direct by a $\frac{1}{8}$ -hp. motor, it has capacity for real work.

The construction of a supporting framework for the disk and motor is very simple. Fig. 1 shows a top view of the assembly minus the fence. The dimensions, of course, may be changed but will be found about right for easy portability and will support long pieces for either surfacing or edging. Cut two pieces from ordinary 1 by 4-in. stock, one $7\frac{1}{2}$ in. long and the other 24 in. House the shorter piece into the longer for the base, as in Fig. 2, and secure the joint with screws and glue. Cut a piece, 24 in. long, from 1 by 6-in. stock for the worktable and plane both surfaces smooth. Cut a recess on one edge, 8 in. long and $\frac{1}{4}$ in. deep, as shown. Round the corners for neatness, and secure this piece to the base with screws and glue.



A Disk Sander of Real Capacity for Home Workshop; It Can Be Made in a Couple of Hours, and Saves Much Hard Work

Cut a piece from 1 by 8-in. stock to 7 in. in length, square up and surface for the motor table. Lock it in place as in Fig. 1, with screws and glue. Note



Adjusting the Sand Disk to the Fence or Guide by Shifting the Motor on the Table

that one end of this base or support bears on the lengthwise piece of the base, to which it is nailed at each corner. This overcomes the tendency to vibrate when the motor is running.

For a guide or fence, saw out two pieces of the form and dimensions shown in Fig. 3. Fasten these by means of cleats, screwed and glued to the frame as in the rear photo. Test each guide piece with the square. Plane until the two sections of the fence are exactly at right angles with the table. Put on the disk and set the motor in place. Lay a length of 1 by 6-in. stock along the fence, edge up, and bring the disk up to this. Bore holes and fasten the motor with $\frac{1}{4}$ -in. bolts, making sure that the surface of the disk does not project beyond the guide more than $\frac{1}{16}$ in. at the most; the outfit will do better work if it projects less. Unlike hand sanding, it must be remembered that pressure on the work is not good practice when using a power sander, as the pressure, coupled with the high speed, will cause the paper to burn and scratch the work, leaving unsightly marks and dark streaks which are next to impossible to remedy. Only sufficient pressure to keep the work in contact with the disk should be applied, for garnet

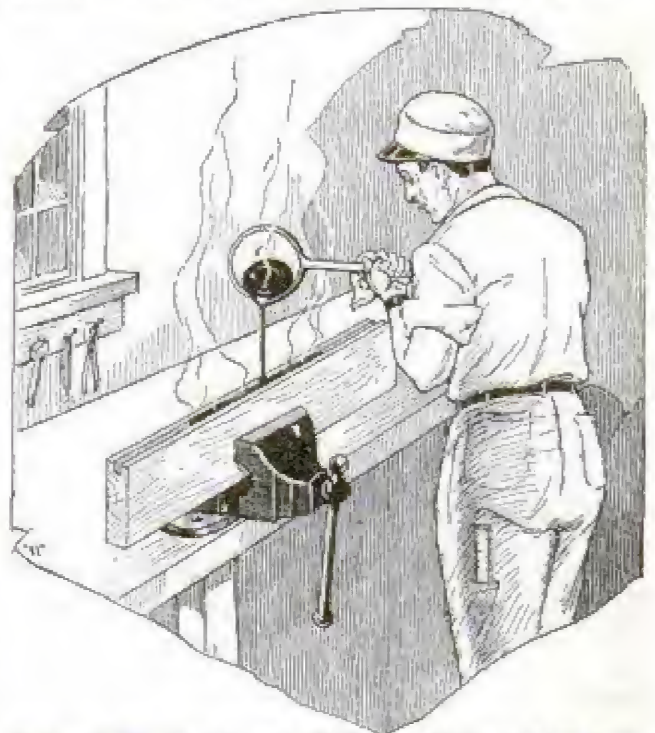
paper running at high speed cuts freely and very fast. The work should be held by the fence, not by the disk.

For best results an 8 or 8½-in. disk of good make should be used, on the shaft of a $\frac{1}{2}$ -hp. motor. Always use a ball-thrust bearing between the disk collar and the motor bearing to absorb the end thrust and relieve the latter of undue wear. Both disk and thrust bearing are obtainable at most well-stocked hardware stores where small workshop-machine units are carried.

As will be seen from the illustrations, nearly the whole surface of the disk is brought to bear on the work. While not in accord with the usual arrangement, exposing but the upper half of the disk, this assembly increases the capacity materially. By using a very fine-grit paper, it is possible to put a smooth clean finish on work of considerable size.

Converting Chunk Lead into Small Bars

Chunk lead can readily be converted into small bars for convenience in lead burning on storage-battery work. A piece of any kind of wood flooring having a good groove is placed in a bench vise and leveled with the groove up, which is then poured full of melted lead or solder. The pouring should be started from the center so that no dam will be required at the ends.—Fred W. Page, Winfield, Kans.



Strip of Flooring Forms Mold for Making Bars from Chunk Lead

Curing Knock in Ford

To cure a knock which I have often noticed in the model-A Fords, I obtained the small pins and sleeves used to secure the Lincoln piston pins and fitted them on the piston pins of the Ford, doing away with the lock ring in the center of the pin. It is necessary to drill two $\frac{3}{16}$ -in. holes in the piston bosses, and to slot the piston pins to fit the small pins; the small sleeves are cut to fit.—R. M. Shelton, Dallas, Tex.

Stock Spring for Blanking Die

In designing and making combined piercing and blanking dies for small machine parts, a spring is usually needed to hold the strip of stock against one of the guides, so the pilots on the blanking punch will enter the pierced holes properly each time the strip is moved forward against the stop finger. The writer has found a flat spring, as shown in the drawing, easy to make and satisfactory to use. It is made nearly as wide as the guide is high, and of suitable thickness to give the required pressure. One end of the spring is held in a slot cut in the guide with a



hacksaw of the right thickness to allow a tight fit, or the spring may be made long enough to enter a slot at each end, with one or both ends a free fit.

It may be applied to either the back or the front guide. The guide opposite the spring should be hardened. Cyanide hardening is sufficient for this purpose. The drawing shows guides separate from the stripper plate, but the stock spring may be set into a guide made integral with the stripper if desired.—Ernest L. Holcomb, Farmington, Conn.

Swinging Side Boards for Wheelbarrow Facilitate Dumping

When repairing an old wheelbarrow, I decided to try swinging side boards, as shown in the illustration. They were hinged at the front end so that they would

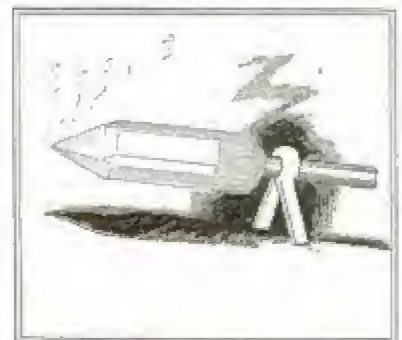


Hinged Side Boards on Wheelbarrow Permit Load to Be Dumped Quickly

swing outward. Door bolts were fitted at the other end, near the bottom, to hold the sides securely when closed. Pulling the bolt, releases the board and enables the user to dump the load quickly to either side.—Leslie H. Phinney, Orange, Mass.

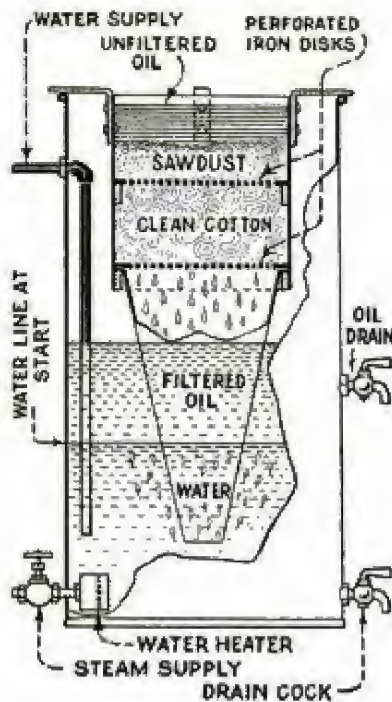
Rest for the Soldering Iron

Here is a kink that will be appreciated by many who constantly use a soldering iron. One of the handiest rests for the iron can be made from an ordinary cotter pin, slipped over the shank, as shown in the drawing. The cotter pin used for this purpose should be of the heavy variety, and the legs should be cut off $\frac{1}{2}$ or $\frac{3}{4}$ in., and spread apart at an angle of 45° . The shank of the iron should be a loose fit in the eye of the cotter pin so that the latter can slip around easily. The legs of the pin will then always turn downward, which is, of course, desired when laying the iron aside.



Filter for Used Crankcase Oil

The drawing shows a device that has been found effective for filtering old auto crankcase oil.



It consists of two sheet-iron tanks, the smaller being suspended inside of the larger one by means of a few flat-iron hooks riveted to the side. The bottom of the smaller tank is cut away except for a strip at the edge, which is used as a support for a sheet-metal disk, perforated with small holes. A layer of clean cotton waste is laid on the disk, and another disk, of the same size as the first and similarly perforated, is placed over the cotton as indicated. It is supported by a narrow strip of flat iron riveted to the inside of the tank. A quantity of coarse sawdust, which has been washed and dried, is placed on the second disk. A large cone or funnel is attached to the bottom of the small tank. The best method of attachment is to bend the wide rim outward and slip it down into the small tank so that it will rest on the same flange as the first disk. Of course, the cone must be put in before the disk. In the larger tank, a drain cock and a steam water heater are fitted in the side near the bottom, an oil-drain cock about half-way up, and a water-supply pipe at the top, the pipe extending down toward the bottom, as shown. The large tank is filled about one-third with water, which is kept boiling by the heater. Old crankcase oil is emptied into the small tank, and as it filters through, more oil is added until the lower tank is filled up to the oil-drain cock. Keep the water boiling for six hours or more, and then let the oil cool. Draw off some of the water and replace this with cold water. The cleaned oil then

can be drawn off gradually as the cold water pushes it upward.—James E. Noble, Toronto, Can.

Removing Lead from Wood

A contractor securing a job of refinishing some church benches, damaged in a fire, found that the melted lead from the skylight had spattered over some of them, burning into the wood wherever any of it struck. The problem was how to remove this lead. A scraper made no impression on it and sandpapering only rubbed the particles farther into the wood. After much experimenting, the finisher discovered that when the wood was thoroughly cleaned of the old varnish, the lead could be easily rolled out with sandpaper while the surface was wet with gasoline.

Paint Scraper for Tinnners

In places where the temperature varies from hot summer weather to below zero in the winter, expansion and contraction often opens up the soldered joints in tin roofs of buildings, and as there is usually a heavy roof paint to be removed before the tin can be brightened and the seam resoldered, a scraper made like the one shown in the drawing, will be found of great help. It is made from an old flat file, which is heated and bent at right angles about 1 in. from the end. The file should be left to cool without tempering, as it can then be re-sharpened right on the job with another file, and



will not be so apt to crumble. The end is round with a bevel on the inside. This places the cutting edge at an angle of 90° to the surface of the roof when scraping, as the handle usually is held at an angle of 45°. The side edges of the scraper can also be sharpened for working against the side of a lapped joint.



Another Way to Save Money

Copyright, Popular Mechanics

Plan No. 5-W-11

A PENNY saved may be a dollar earned, if you save enough of them. Four hundred and fifty thousand pennies are tied up in a \$4,500 house. If, on the hundreds of items that go into the construction of a new house, you can save a penny here and a penny there, you may be able to roll up enough dollars to pay off a first mortgage in one-half the time it normally requires. It's worth figuring about.

Your house built on a "split-penny" plan need not be cheap or inferior in quality. Not at all. Splitting pennies merely means watching out, with an eagle eye, for the little things, the details, and taking advantage of the latest methods to save pennies.

For example, as many as fifty different tradesmen may profit on a little house costing \$4,500, to say noth-



HOW TO GET A BLUEPRINT

To help our readers get started on one of life's most glorious experiences—building and owning a home—Popular Mechanics Magazine will supply readers a one-sheet blueprint of any house appearing in the magazine for \$1. This blueprint does away with the necessity of first purchasing a complete set of plans to find out whether you can afford to build. It contains floor plans, elevations, a section detail, size of joists, studs, etc., and also a brief specification. Submit it to tradesmen and dealers for building estimates.

ing of the profit you pay dealers from whom you buy materials and the added profit to the manufacturers who fabricate the raw products. Five dollars saved on each one of these transactions amounts to \$250

earned That's the price of a pretty good heating plant. An easy way to save money is to use "stock" materials. What is meant by stock materials? Just this: In

the early days of hand labor, only the houses of the wealthy were equipped with fine millwork, beautiful moldings, expertly finished trim, etc. Hand labor was expensive and still is. Today, however, machines have been invented that produce, with the precision and skill of human hands, as finely wrought stock millwork and interior details as the most discriminating person may

ask for. And all within reach of the average pocketbook. Volume production in millwork, like volume production in automobiles, places at your disposal fine quality, good workmanship and, in many cases, super-finish at extremely low cost. You may obtain from most any lumber dealer reproductions of the world's most famous masterpieces in entrance doors, fireplace mantels, etc., at what may be truthfully called "five and dime" prices, compared with the price for hand labor.

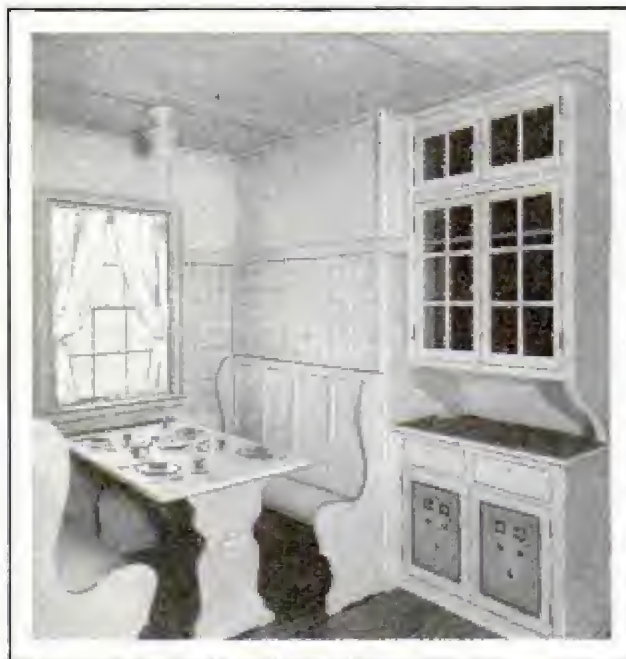
A recent reproduction, by machine, of a famous colonial mantelpiece in a century-old Virginia mansion may be purchased from dealers' stocks, ready to use, at around \$30. It looks, for all the world, like a \$200 or \$300 job. This is typical of what many manufacturers are doing with the machine, to help you keep down cost and at the same time give you style, quality, fine finish and good workmanship.

As an added means of penny splitting toward dollar saving, why not design your house to fit stock-dimension lumber and other stock structural members carried in every dealer's warehouse. By so doing, you can eliminate much waste of lumber. This may not seem worth while, but it amounts to considerable money. Anything that cuts out waste and cuts down

labor means just that much money saved. So, watch out, when you plan your house, to see that ceiling heights, finish trim, millwork, in fact everything possible, tune in,

so to speak, with what's waiting for you, ready to use.

The bungalow illustrated this month is a stock job. There's not an item here that cannot be delivered almost instantly from dealers' yards and store-rooms. This is a lumber house with sidewalls and roof laid in red-cedar edge-grain shingles. Shingles, by the way, not only give excellent service but, when used over frame construction



Courtesy Curtis Companies Service Bureau

for walls and roof, produce about as low-cost a home as you can build.

You have complete bungalow service on the first floor—including two sleeping rooms—with space above for more bedrooms and storage. If you want to rent a room, this is possible by cutting a door into the front bedroom, to open onto the sun porch. The sun porch is a feature. There's a full basement and the house is fully insulated, sidewalls and ceilings.

The choice of an insulation material depends on the climate and the amount of money you want to spend. There are a dozen or more brands of good insulations on the market, in blanket, board and poured forms. The cost depends largely on the thickness of the insulation.

In round numbers, this is a \$5,000 house. It may cost less and perhaps more, depending upon where you build it and the materials you select. Stick to stock materials. They save money. And, if possible, take a hand at the job yourself.

PLAN BOOK FOR READERS

A NEW BUNGALOW BOOK: Sixteen selected low-cost bungalows in popular styles, at prices ranging from \$5,000 down to \$2,000. Each house fully described and illustrated. Send ten cents in stamps to cover mailing.

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And every blade, of every "Yankee" Screw-driver, is individually tested and twice tested at factory before delivery to dealer for you.

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Removable from base for holding work on drill-press or other machines. True all sides. Jaws open, 3½ inches; price, \$9.90. Other sizes, \$3.75 up.

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You will find the 2¢ stamp you use to get your free copy of "How to Judge a Used Car" just as good an investment! It tells you trade secrets. It illustrates, in 32 pages of interesting text and pictures, just what to look for in the used car you buy—what speedometer readings mean, how to avoid "orphans," what code prices mean, how to set a fair price on a used car offered by a friend, and a host of other important points in used car buying. Send today for your free copy—spend 2¢ and avoid \$200 mistakes!

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- 1 Every used car is conspicuously marked with its lowest price in plain figures, and that price, just as the price of our new cars, is rigidly maintained.
- 2 All Studebaker automobiles which are sold as CERTIFIED CARS have been properly reconditioned, and carry a 30-day guarantee for replacement of defective parts and free service on adjustments.
- 3 Every purchaser of a used car may drive it for five days, and then, if not satisfied for any reason, turn it back and apply the money paid as a credit on the purchase of any other car in stock—new or used. (It is assumed that the car has not been damaged in the meantime.)

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Disston No. 36 $\frac{1}{2}$ Hack Saw Frame takes all blades from 8 to 12 inches long. Stretchers are reversible for sawing straight or sidewise. Hand hole large and comfortable. Frame, \$2.10.



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Disston makes all kinds, sizes and styles of files for every purpose. A Disston 8-inch Mill File, bastard cut, is fine for sharpening axes, lawn mowers, garden tools, and general work in the home and shop. Excellent for finishing metal surfaces. 25 cents each.



Handiest of All Small Saws

The Back Saw, with fine teeth and stiff back, enables you to do smooth, accurate cutting of mitres, grooves, etc., for making furniture, picture frames, etc. Disston No. 4, 12-inch size, 3 inches under back, 14-point, costs \$3.00.



USE Disston blades, which cut easier and stay sharp longer. Blades with 18 teeth to inch (regular), are best for general use; those with 24 teeth (medium), are best for cutting 16- to 20-gauge sheet metal or tubing, brass or copper, and those with 32 teeth (fine), are best for cutting thinner tubing and sheet metal.

Strain blade *tightly* in frame. Cut slowly—not more than 60 strokes per minute for best results. Put pressure on forward stroke; lift slightly on return stroke. Make each stroke do its work. Cut straight; do not bend blade. Bending, looseness of blade, and sawing thin metal with teeth too coarse for the job, all result in broken blades.

Disston Hack Saw Blades are made of Disston Steel. The teeth are milled at a special angle, to give them the greatest cutting speed and durability. Every third tooth is a "cleaner" tooth, to carry chips out of the cut and save the cutting edges.

Disston regular *All-Hard* (Chromol) Blades are suitable for general use. Disston *Flexible* (Durallex) Blades are preferred where cutting is done in awkward positions, or in unstable material, such as flexible conduit, or where there is danger of breaking All-Hard blades.

Disston All-Hard or Flexible Hack Saw Blades, 8", 60c doz.; 10", 65c doz.; 12", 75c doz. Good hardware merchants everywhere sell Disston Hack Saw Blades and Disston Hack Saw Frames.

DISSTON

Makers of "THE SAW MOST CARPENTERS USE"



A Disston Hack Saw Frame for Use in Close Quarters

Disston No. 200 Hack Saw Frame enables you to cut where wide frames can't get in. Only 1 inch from tooth-edge to inside of back. Takes 8-inch blades. Frame, 70 cents.



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"The Saw Most Carpenters Use"

The two handiest saws for the home workshop are the 26-inch 8-point for cross-cutting, and the 26-inch 5 $\frac{1}{4}$ -point for ripping. You will need these on almost every job. The popular "D-8" Lightweight cost \$3.45.



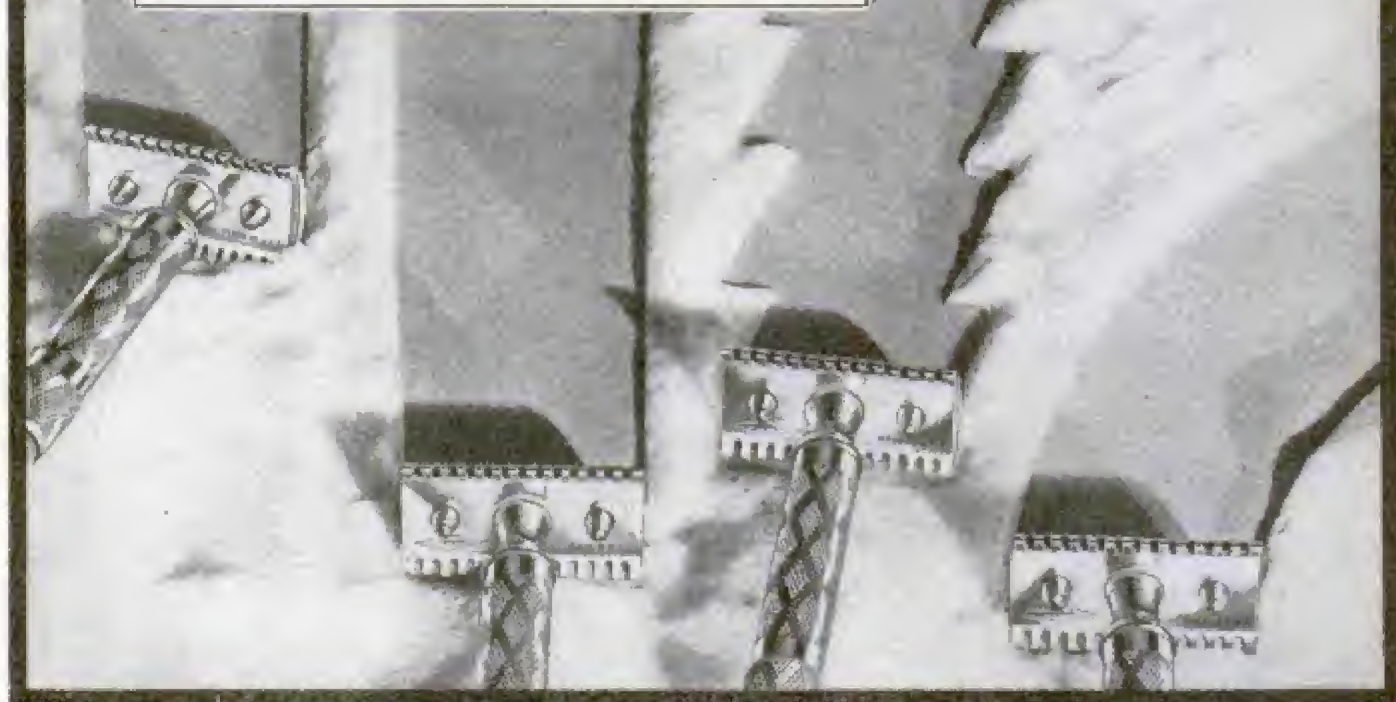
Every saw user will enjoy reading "The Disston Saw, Tool and File Book," an illustrated manual on the selection, care and use of tools. It tells how to file and set saws and contains much other helpful information. Sent free. Use the coupon, or write for it.



Henry Disston & Sons, Inc., Philadelphia, U. S. A.
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Name and Address.....

A smooth shave
depends upon the correct stroke
Which do you use...?



EIGHT out of ten American men shave with a Gillette Razor, and probably not more than half of them use the correct diagonal stroke shown at the extreme left.

But they all judge a shave on its face value, and they find the value *there* in every Gillette Blade, no matter what stroke they happen to use. Gillette has put it there — designed the blade to meet all possible changing conditions.

In the past ten years the Gillette plant has invested

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chines is tested and re-tested by a long line of inspectors who get a bonus for every blade they discard.

Tomorrow morning slip a fresh Gillette Blade into its holder. Lather well and use the correct diagonal stroke. Let the world's best blade in the world's best razor give you the best of all possible shaves. Gillette Safety Razor Co., Boston, U. S. A.

King C. Gillette

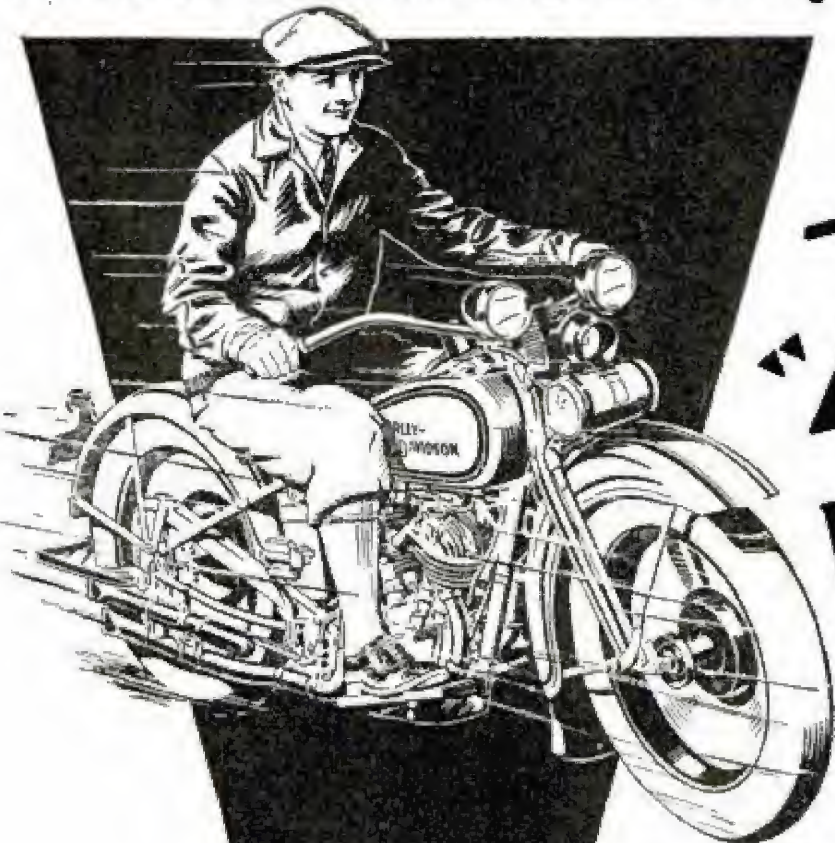


THE only individual in history, ancient or modern, whose picture and signature are found in every city and town, in every country in the world, is King C. Gillette. This picture and signature are universal sign-language for a perfect shave.



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*-it's the
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1930 model*

SWING into the comfortable saddle of this motorcycle—let its quiet, powerful motor whisk you over hills and down beckoning roads—feel its eager response to throttle and brakes, the perfect balance of its low riding position, the restful comfort of its springing and its big, 4-inch balloon tires. What a motorcycle!

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(6)

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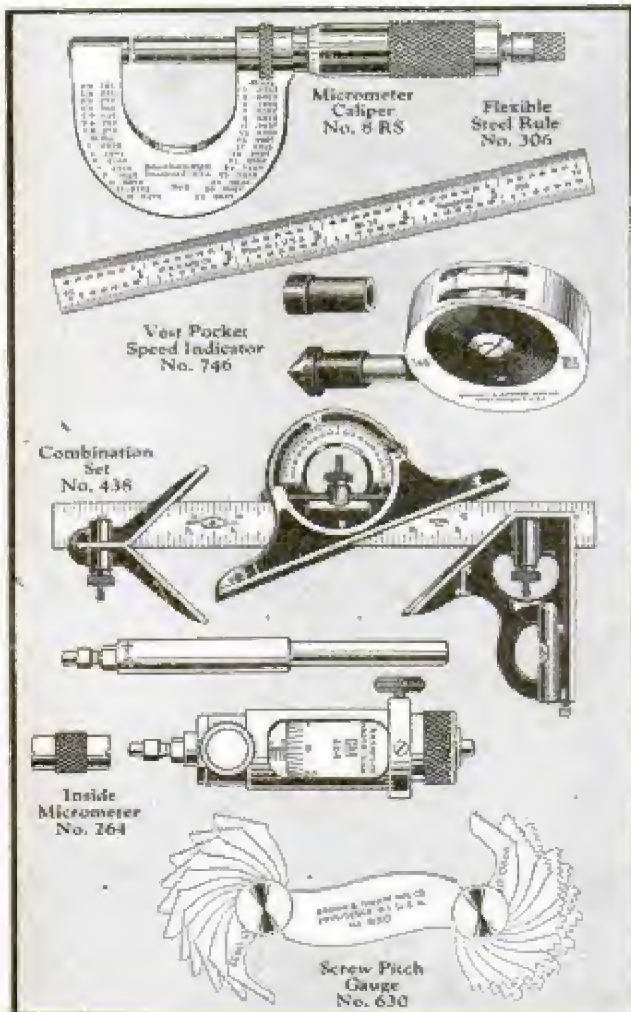
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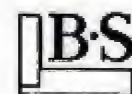
Keeping Pace With The Greater Demands *for* Accuracy



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It is with a recognition of this dependence on fine tools that more and more skilled mechanics and manufacturers are turning to Brown & Sharpe Tools. They know that the standard of accuracy maintained in Brown & Sharpe Tools is their greatest safeguard for accurate work.

The Brown & Sharpe Planer and Shaper Gauge No. 625 shown above is an exceptionally convenient tool for setting up cutting tools quickly and accurately. It is but one of over 2300 tools described in the new Small Tool Catalog No. 31. Your hardware dealer will be glad to give you a copy or you can get one from us. Address Dept. P.M., Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.



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"Heats as Good as Ever!"
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"This is the second winter I have used the Bulldog and the savings in my coal bills have paid for my furnace!" Milton E. Spain, Casey, Ia.

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"My 8 room house has 7 windows on the Northwest side downstairs, so it takes SOME heat! The Bulldog doesn't burn very much more coal than my old stove used to, and it heats the whole house, where my stove would heat only the one room it was in."

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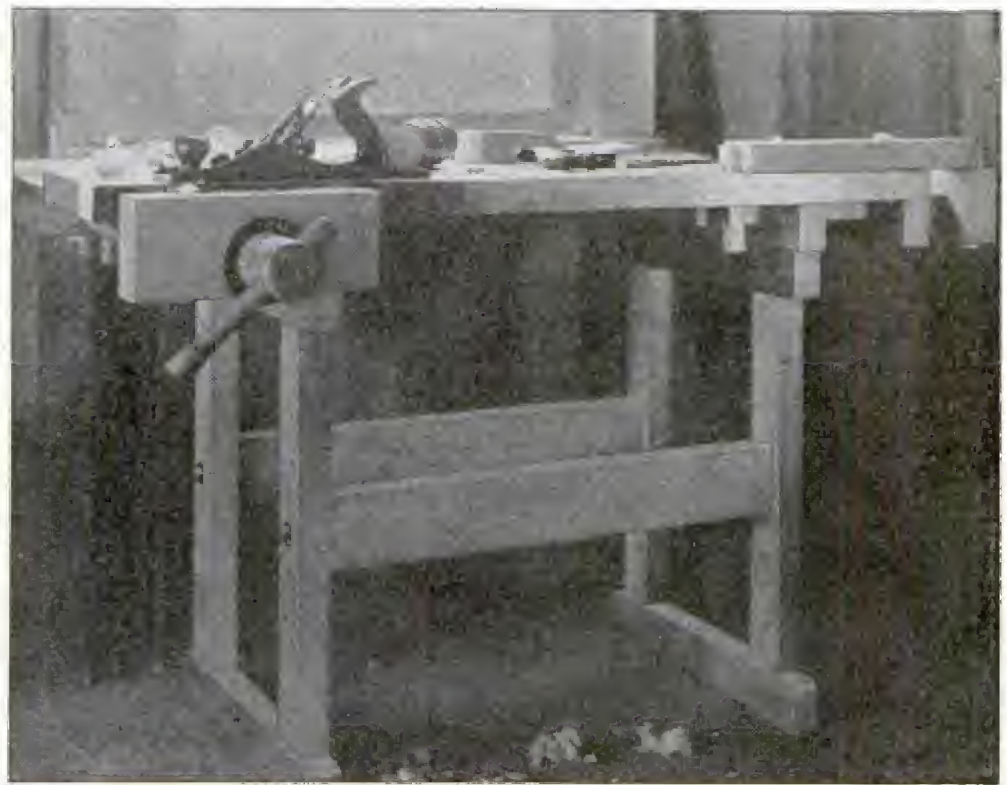


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What you have always wanted for your home work shop, a real work bench, in place of a makeshift table. Any man handy with tools can easily make this practical, substantial bench with the help of LePage's step-by-step printed directions and complete dimension drawings. It is an excellent introduction to the eleven other projects you can make with LePage's Job Plans and 20 other projects with LePage's Third Home Work Shop Book.

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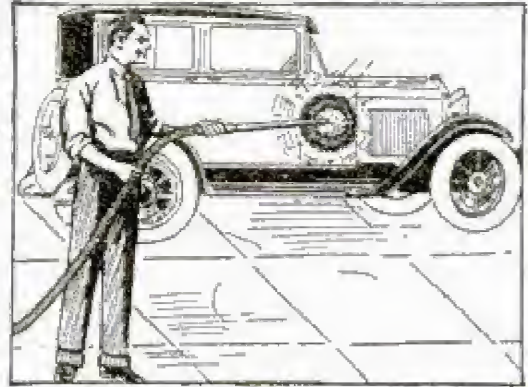


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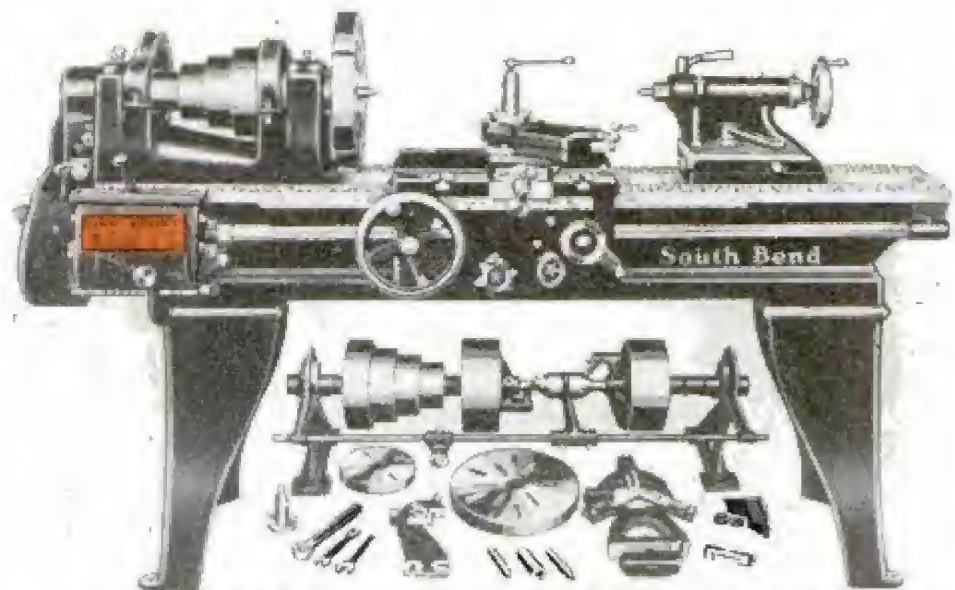
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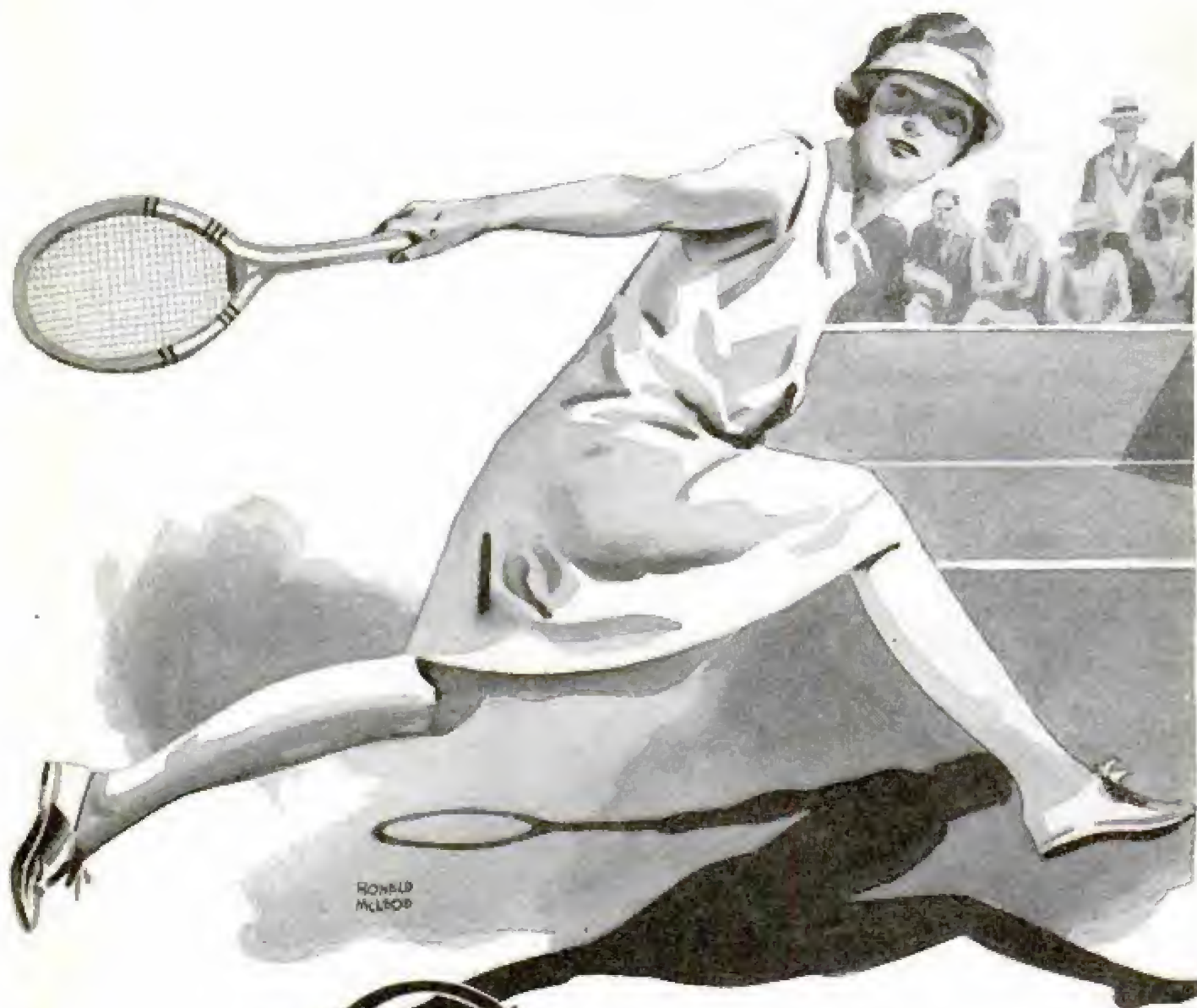
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TASTE *above everything*

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... not only BLENDED but CROSS-BLENDED



MILD...and yet
THEY SATISFY





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Instantly your beard gets moist...easier to cut and pliable...scientifically softened right down at the base...then your razor can do its best work.

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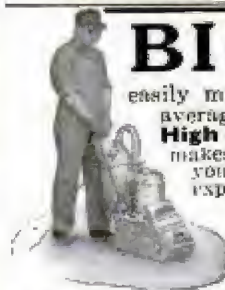
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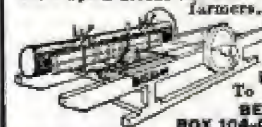
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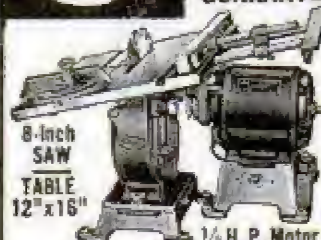
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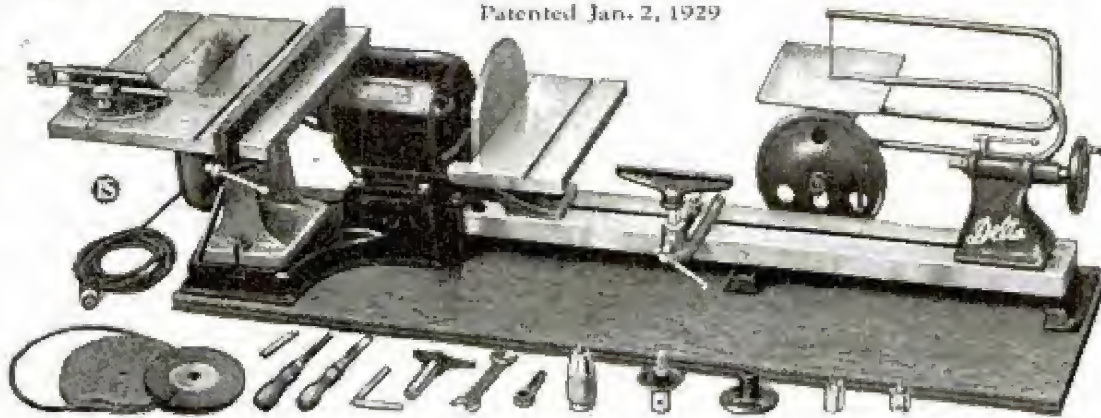
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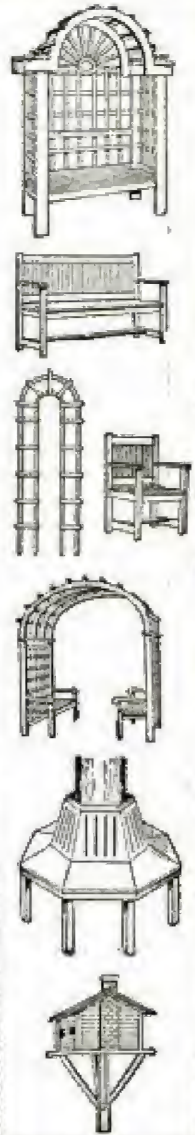
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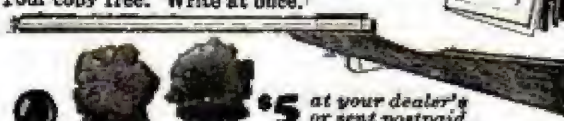
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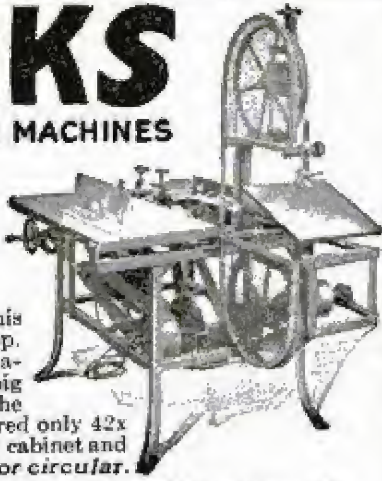
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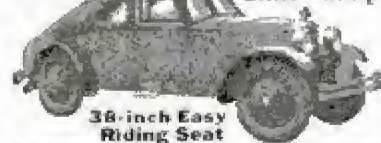


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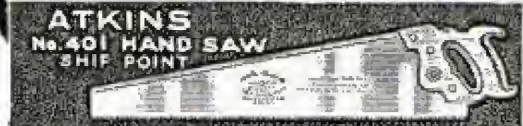
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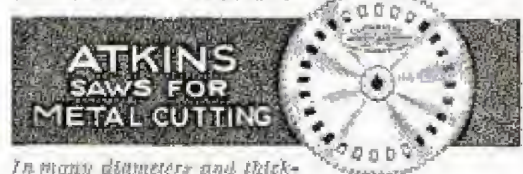
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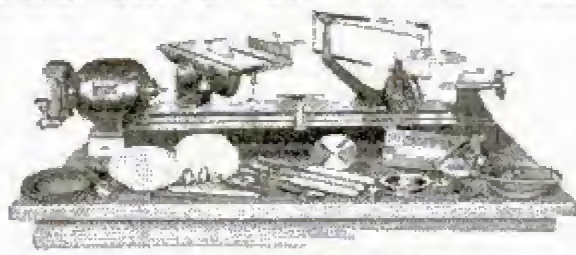


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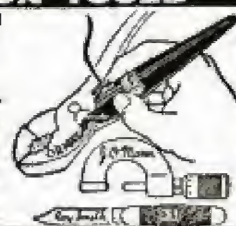
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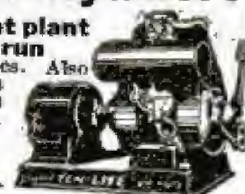


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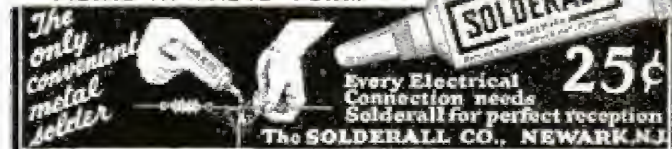
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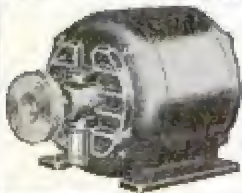
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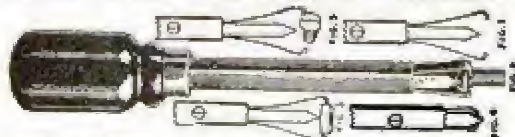


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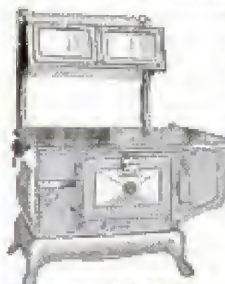
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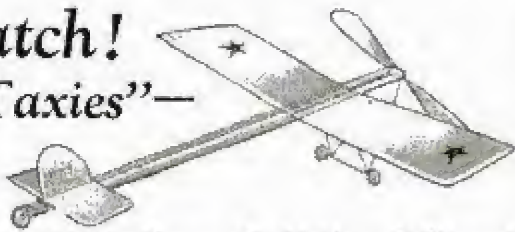
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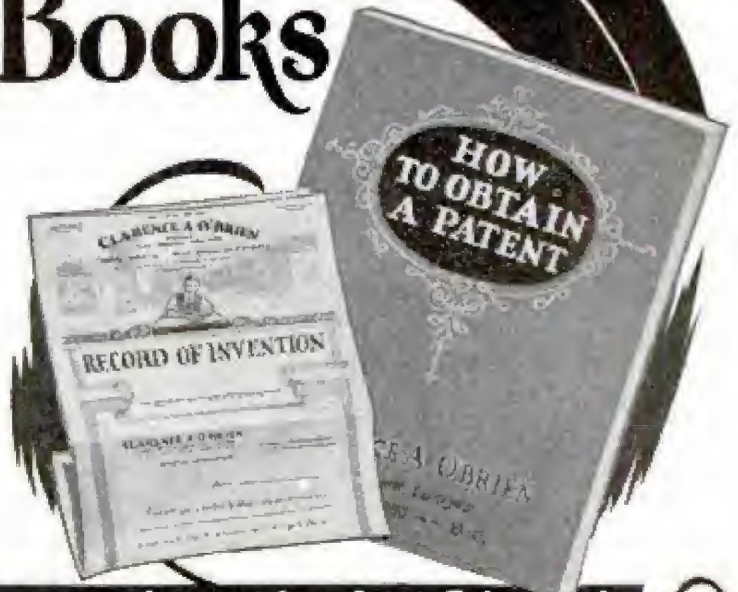
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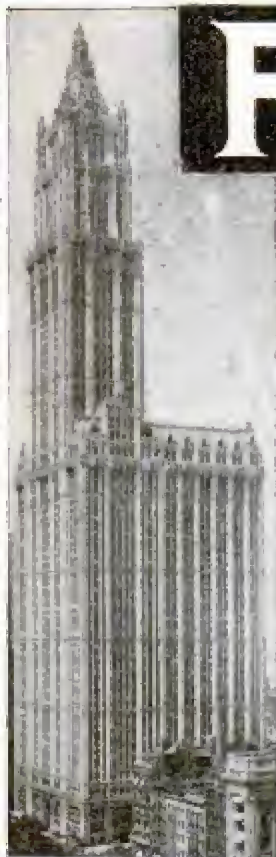
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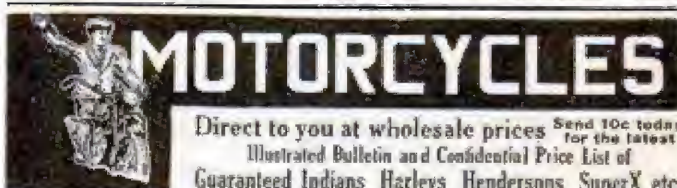
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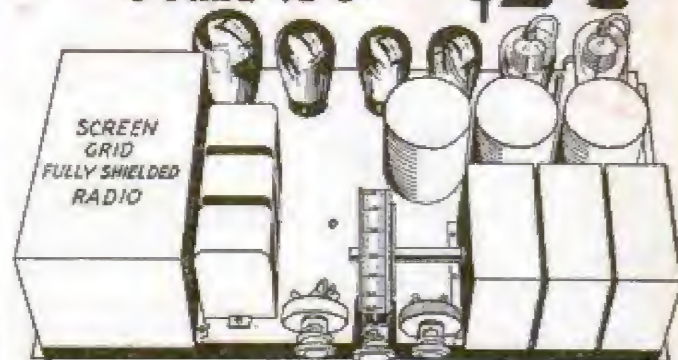
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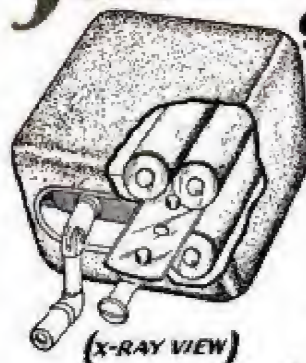
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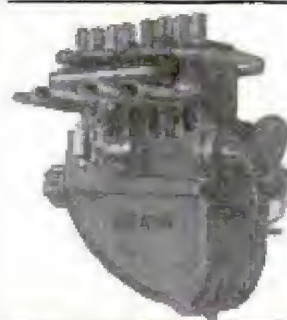
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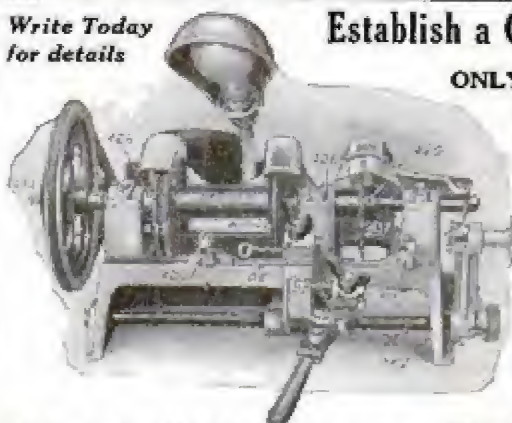
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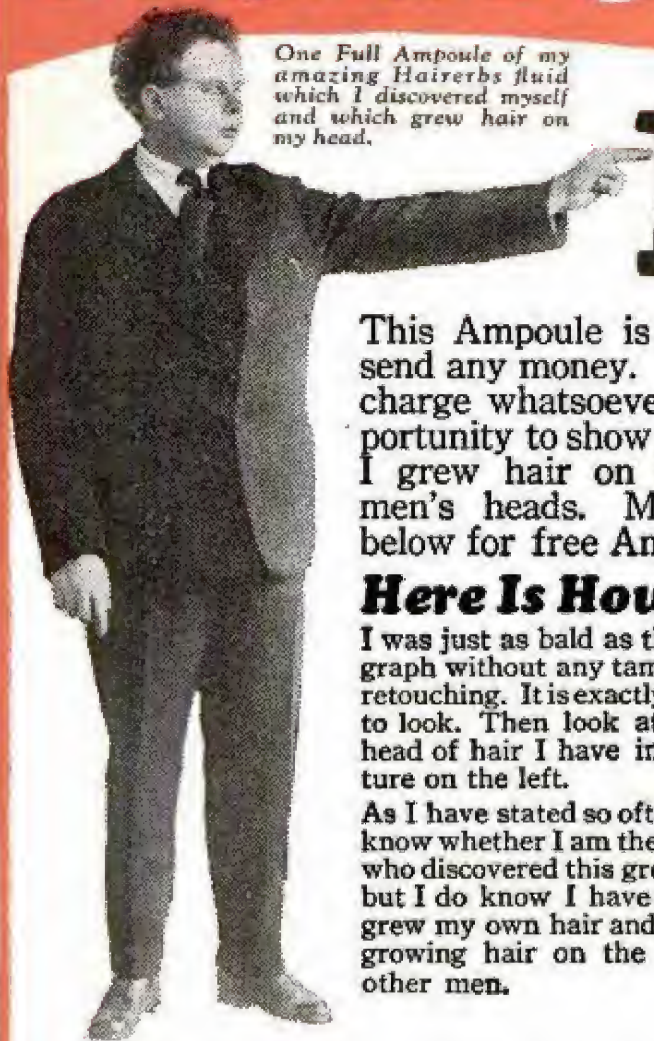
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This Ampoule is absolutely free. Don't send any money. There is no C.O.D. No charge whatsoever. All I want is an opportunity to show you the fluid with which I grew hair on my own and on other men's heads. Merely mail the coupon below for free Ampoule.

Here Is How I Used to Look

I was just as bald as this picture. It is a true photograph without any tampering or retouching. It is exactly as I used to look. Then look at the full head of hair I have in the picture on the left.

As I have stated so often, I don't know whether I am the first man who discovered this great secret, but I do know I have it, that I grew my own hair and that I am growing hair on the heads of other men.



Bald Men It's No Joke to be Bald!

What I accomplished on my own head and on other heads I believe I can do for you, provided you are under 45 years of age and loss of hair was not brought about by burns, scars, or other causes leading to absolutely dead hair roots. Anyhow, I must succeed or your money is refunded in strict accordance with my guarantee. No apparatus. My home treatment is simple and easily applied.

Mail This Free Coupon!

Mail the coupon today—Right Now—I will send you, immediately, one full Ampoule of my marvelous Hairerbs fluid which I discovered, of which I hold the secret and which grew my own hair on my bald head. Besides the Free Ampoule of Fluid, I will send photographs, names and addresses of men and women who successfully used my Hairerbs Fluid for Dandruff, falling and loss of hair.

Vreeland

1356 Euclid-Windsor Bldg., Cleveland, O.



These are exact untouched photographs of Miss Augustine Raimondo, 2530 East 25th Street, Cleveland, who was almost entirely bald. House physicians, hospitals and clinics told her that she would be bald for life. She saw one of our advertisements, became interested and began taking treatments with Hairerbs. The growth of hair was surprisingly fast. Today Miss Raimondo has a full head of hair. This case is open for investigation by anyone.

FREE COUPON

Vreeland 1356 Euclid-Windsor Bldg. CLEVELAND, OHIO

Please send me, entirely free, one full Ampoule of the same Wonderful Hairerbs Fluid which grew your hair.

My Name

My Address

State

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**A Comfortable Folding Table
for the INSIDE of Your Car**

NOW you don't have to worry about the weather when out for a trip in your car. Have your lunch, do your writing or reading **INSIDE** the car in comfort, with Stone's Folding Auto Table (patent pending). Solid and substantial, 16 by 28 inches. Will hold a lot of weight. Plenty of leg room under the table. Just the thing for Picnickers, Tourists, Salesmen, Hunters, Fishermen and everyone.

Fits All Sedans and Coaches

No tools necessary. Slips right on the robe rail, cord, or special loops furnished for cars not equipped with robe carrier. Covered with beautiful Fabrikoid. Folds up compactly.

Money-Back Guarantee

Send your check or money order for \$4.75 and we will ship you a Stone's Folding Auto Table postpaid. If you are not perfectly satisfied, return it within 10 days and your money will be refunded. Or, write for descriptive circular.

NEW ERA PRODUCTS COMPANY
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Dealers: Write for proposition



100,000,000 Brake Drums to Be Re-Cut

*Are You Realizing on the Dollars
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Millions of Brake drums are out of round and need truing up to give the owner maximum braking.

This KORNAU Lathe Will Make Money for You

It will cut drums true to round, inside or outside—smooth without chatter marks. Six spindle speeds. Power Feed. Automatic Stops.

Operation experience unnecessary. Simply set depth of cut desired. The Lathe will do the rest.

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**To
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\$2 Deposit—\$1.25 Week

This exquisite, diamond ring is considered extremely handsome. A fine quality, full cut, genuine blue-white diamond full of fiery brilliance and sparkling colors, is set in this lady's, popular 18 Kt. white gold mounting. It makes a wonderful engagement ring or friendship ring. Your friends will think you paid \$100 for it. Everyone will admire it. The gift case is free. Sold on written guarantee.

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Trial**

18 KARAT

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You can now buy this gorgeous ring at the wholesale price. Compare it with similar rings at \$100. We guarantee it to stand any test or comparison. Greatest bargain offered by any Diamond Importer. We allow 6% annual increase in exchange for a larger diamond ring.

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All the proof you want—of our honesty, fairness, size, financial integrity, radio experience and the performance of our sets—including Amazing Factory Offer—sent without obligation!

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My 30 days trial on my Miraco AC-9 is up and if you would offer me \$200 extra for it back, I would tell you nothing doing. We had some very expensive sets in our home, one a \$425 9-tube AC set. Thanks to you I have a set that gets any and all stations. I have got stations in 45 states, also Cuba and Canada. It is beyond words to tell you what we think of our wonderful bargain. I will always praise Miraco's to everyone. J. W. LAUDERBACK, Barberton, Ohio.

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SPECIAL! ELECTRIC AC-7 \$39.⁸⁵

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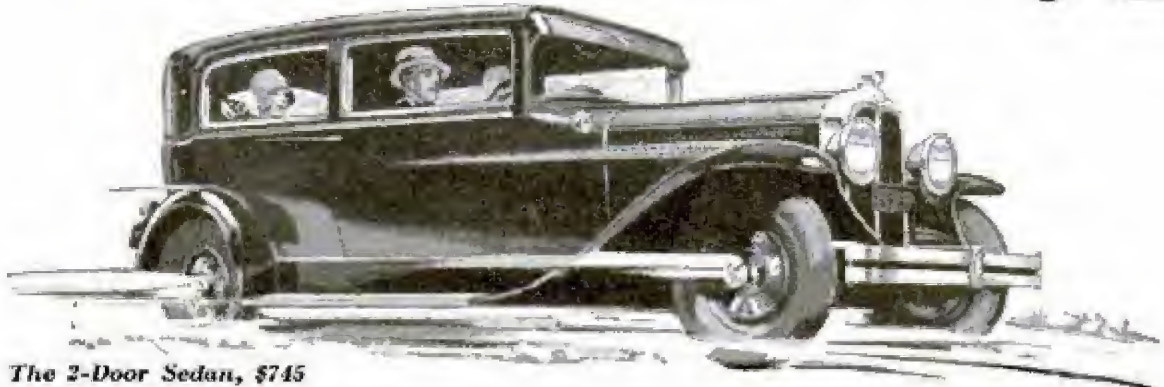
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THE PONTIAC BIG SIX

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*The 2-Door Sedan, \$745
Body by Fisher*

The striking superiority of the Pontiac Big Six in every detail of its mechanical construction has been responsible for much of Pontiac's amazing success. In this, as in every other respect, it is definitely the leader of the low-priced sixes—a car which the motorist interested in advanced automotive design will immediately recognize as offering *more* real value for every dollar invested.

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The “fifth wheel”—most accurate of all speed measuring devices—shows that Pontiac has the highest top speed of any six at the price.

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The “fifth wheel” test reveals that the Pontiac Big Six gets away faster than any other six-cylinder car in its price class.

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It has strikingly smart bodies by Fisher, in a wide selection of popular Duco colors—concave belt moulding—flaring 70-inch fenders.

PONTIAC has more safety

Two completely independent braking systems—noiseless, enclosed, internal four-wheel service brakes—and a separate emergency brake working on the transmission—provide an extra margin of driving safety. Full tread axles—front and rear—give increased safety and handling ease on dirt roads.

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Prices, \$745 to \$895, f. o. b. Pontiac, Michigan, plus delivery charges.
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Prostate trouble is now reached immediately by a new kind of home treatment—a new safe hygiene that goes directly to the gland itself, without drugs, medicine, massage, lessons, diet or the application of electricity. It is absolutely safe. 50,000 men have used it to restore the prostate gland to normal functioning. The principle involved in this treatment is recommended by practically all the physicians in America. Amazing recoveries are often made in six days. Another grateful effect is usually the

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If you have gland trouble, or any of the symptoms mentioned, write today for scientist's free book, "Why Men Are Old at Forty." You can ask yourself certain frank questions that may reveal your true condition. Every man past 40 should make this test, as insidious prostate disorder often leads to surgery. This book is absolutely free, but mail coupon immediately, as the edition is limited. Address

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The Electro Thermal Company,
2121 Morris Ave., Steubenville, Ohio

Please send me Free, and without obligation, a copy of your booklet, "Why Men Are Old at 40." Mail in plain wrapper.

Name.....

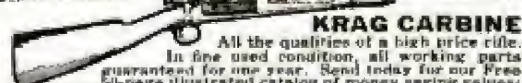
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Overcomes **WEAKNESS** and **ORGANIC AILMENTS** of **WOMEN AND MEN**. Develops **erect, graceful figure**.

Brings restful relief, comfort, ability to do things, health and strength.

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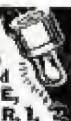
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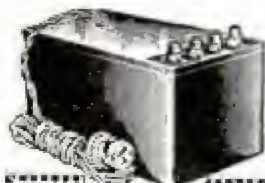
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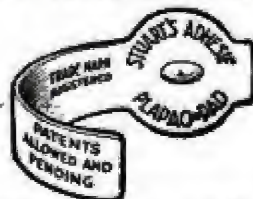
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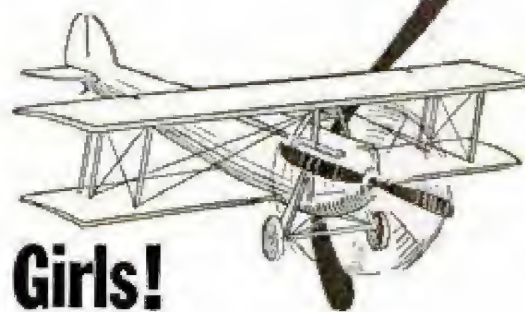
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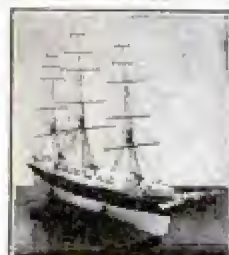
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NOT a flash light! Throws 40 foot circle of light. BURNS FOR 100 HOURS! Non-corrosive, positive action rotary switch throws light. Made of heavy brass for rough usage. Invaluable where open flame is dangerous. Handle adjustable to carry or hang. May be set on side or up-side down. Indispensable utility around house, garage or barn. Fully guaranteed. Uses standard batteries. Over 60,000 sold. Special price offer. Send check or money order. Postage paid.

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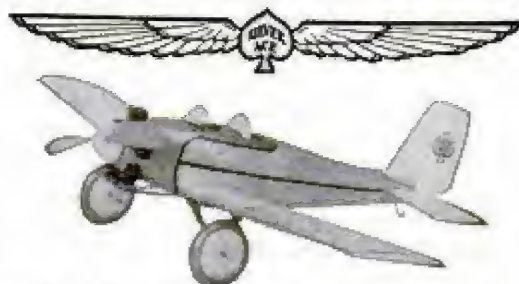
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F-21 LOW WING MODEL

Wing Span 25 inches

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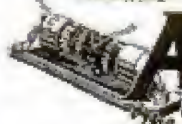
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Like the corner cop directing traffic, **AMPERITE** controls tube voltage. Self-adjusting, dependable, accurate. A type for every tube—A.C. or D.C. \$1.10 with mounting (in U. S. A.) at all dealers.

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The "SELF-ADJUSTING" Rheostat

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There's no hunk about tuning in G5SW of England, PCJ of Holland, and other short-wave broadcasters, right in your own neighborhood. Others are doing it. You can. The secret is micrometric control of oscillation—maximum sensitivity without garbled sounds. The Clarostat regeneration control and accurate plate voltage is the answer. If interested—

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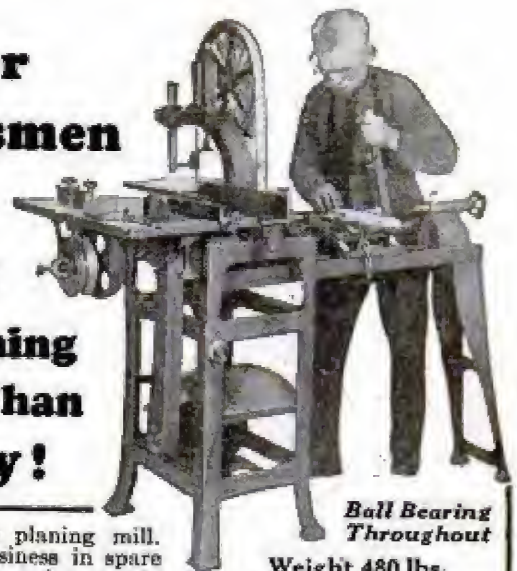
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The directors were amazed at his lightning calculations

...yet he solved their mathematical problems with a simple device that anyone can use.

ONE of the department heads was speaking. "Those appliances cost us \$9.16 each. Special advertising adds \$1.10 more. The selling price is \$18.00. That means our mark up will be———" He reached for his pencil.

"Forty-three percent," said the President's young secretary. His answer had come like a flash. The directors were amazed at his lightning calculations. Especially so since he repeated the feat again and again during the meeting.

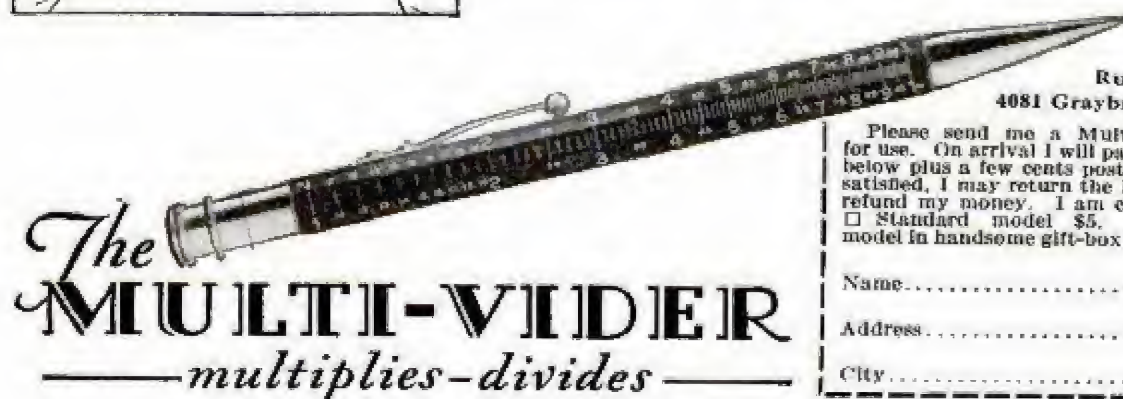
Yet the secretary's method was simplicity itself. He used a Multi-Vider—an amazing lightning calculator and mechanical pencil in one that multiplies, divides, works percentages, proportions, etc. almost instantly.



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Has all the features of a high-grade mechanical pencil—plus the remarkable device for making rapid-fire calculations. Comfortable size—no writer's cramp; outside metal parts gold-filled or sterling silver-filled as desired; takes any standard thin lead; propels, repels, expels; oversized eraser and strong ball clip. Smart-looking, mechanically perfect—yet costs no more than any other fine mechanical pencil. Also makes a wonderful gift.

If your dealer cannot supply you, mail coupon and we will send you a Multi-Vider direct, with simple directions for use. On delivery, pay the postman only \$5.00. (Or \$10 if you prefer the gold-filled Executive model in handsome gift-box.) After five days, if not delighted, simply return it to us and money will be promptly refunded.



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Please send me a Multi-Vider, with instructions for use. On arrival I will pay the postman price quoted below plus a few cents postage. Within 5 days, if not satisfied, I may return the Multi-Vider and you are to refund my money. I am checking the model I want.
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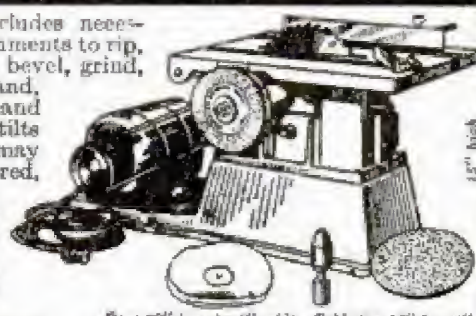
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OUTFIT includes necessary attachments to rip, cross-cut, bevel, grind, mitre, groove, sand, mortise, tenon, and polish. Table tilts to 45° angle and may be raised or lowered, with one hand, in order to get any depth cut from 0" to 2 1/4". Base for saw and motor makes it portable.



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Stop that rumour chatter on your car. MAKE THIS TEST—take out your floor boards, pull your emergency brake back and forth. If you notice play at the ball joint, you need Bredar's Ball Shim. Price \$1.50. Ask your Dealer or order direct. Demand Bredar's Shim.
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Now GET MY GREATEST Log Saw Offer

Fastest Cutting

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FREE Send me your name and address on a postcard today for my wonderful new edition of the Wood Sawing Encyclopedia. Be sure to investigate—it will help you to make big money.

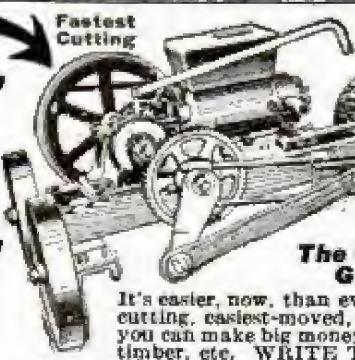
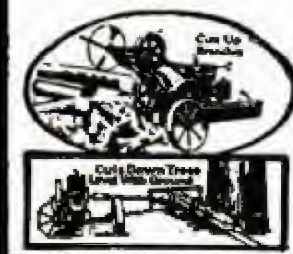
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Now you have a log—in a few seconds it's all sawed up—without any hard work!

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REAL PISTOL LUMINOUS PAINT MAGNIFIER MICROSCOPE FLUOROSCOPE



Here's a real pistol, yet small enough to be used as a watch charm. Illustration is full size. Imported, best European workmanship. Excellent reproduction of standard pistol. Cut shows pistol broken open to load blank cartridge. When trigger is pulled, cartridge goes off with a loud BANG, that can be heard for a block. Pistol entirely made of steel, nickel plated. Handle is beautifully engraved. Octagonal barrel. Comes in box, with cleaning rod and 25 blank cartridge. AT NO EXTRA CHARGE.

No. 8500 Pistol.....Prepaid \$1.25
No. 8500A Set of 25 Cartridges.....Prepaid 25c



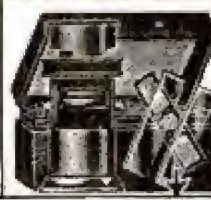
Make your own luminous articles. Paint watch and clock hands, electric light switches, push buttons, keyholes, house numbers, etc. 1,000 uses. Articles treated stand out brilliantly in dark. The darker the room, the more brilliant they are.

No. 8508-A 25c
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No. 8508 Luminous Paint Large Size.....\$1.00



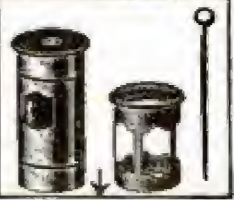
This fine folding pocket magnifying glass, also called linen tester, is made entirely of gold lacquer brass. Has powerful lens that magnifies everything 10 times. Has fixed focus. Just open it and it is ready. When folded this magnifier occupies a space about as large as a quarter and twice as thick.

No. 8516 Magnifier.....Prepaid 35c



Here is a real high power imported microscope for instruction and laboratory work. Has regulation rotating light mirror. Has adjustable lens for correct focusing. With it come 3 specimen slides. Entirely brass. Packed in neat leatherette box.

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This is a fine imported combination in 1 c r o scope. Really two instruments in one. One end used for high magnification, such as seeing bacteria in milk or water. Other end to see parts of insects, flower specimens etc. Finished in gold brass.

No. 8518 Fluoroscope.....Prepaid 65c

FOOLEM HOAX HANGER IO+COMPASS IO+ RUBBER !! BOOTLEG PUZZLE TRICK-SOAP



Box of sponge rubber cigarettes. Can't be told apart when mixed with real ones. Get the laugh on your friends. Nothing like it. This is one of the cleverest novelties ever designed and is made exceedingly well. Even the ends of the cigarette look like real tobacco.

No. 8501 Cigarettes.....Prepaid Box 25c



Latest novelty out. This trick coat-hanger looks just like the regulation article. But try and hang a coat on it and—FLOP down it comes. Hanger has a spring hinge—even a hat pulls it down. Hanger is fastened to wall with nails or screws. Nickel plated.

No. 8523 Hoax Hanger.....Prepaid 25c



Fine imported magnetic compass. ACCURATE. Pocket size. Invaluable for hikers, automobilists. Often saves lives. Use it to tell lies, electric wires; make your own galvanoscope. Fully nickel plated. The actual article is about one-half again as large as illustration shown.

No. 8507 Compass.....Prepaid 10c



Gum is made of sponge rubber. Yanks everybody's description is perfect.

No. 8508 Rubber Gum.....Prepaid 15c
Offer your friends or your girl some chewing gum—They try to chew it. Till they find out its rubber! Five sticks in the packet.

No. 8510 Rubber Gum.....Prepaid 10c



A real stinker. Just try and get the bottle off the boot. It will take you quite a while till you master the intricacies of this clever puzzle. Made entirely of metal. Nickel plated. Size of this puzzle is 2 1/4" x 3 1/4"

No. 8513 Bootleg Puzzle.....Prepaid 20c



Loads of fun with this trick soap. Looks harmless and is intended to "get" the chap who always uses your soap. When he uses it his hands get black as soot and he needs real soap to clean his hands.

No. 8512 Trick Soap.....Prepaid 15c

BLUFFGUN PERISCOPE CALLIOPE NOSE BLOWER WONDERSCOPE TELESCOPE



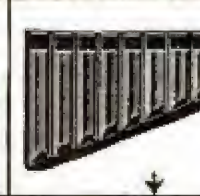
Bluff your friends with this gun. Made of non-position metal handsomely nickel-plated. Exactly same size, weight and shape as real article. Fine to bluff burglars. Used also as desk paper weight. Size of this gun is 6 1/2" long and 3" wide.

No. 8505 Bluffgun.....Prepaid 60c



See what's going on behind your back with this periscope. Used like a magnifying glass. No one knows you're watching them. Gives you "eye" to your back. This article is made in molded bakelite and its size is 2 1/4" x 1 1/4"

No. 8506 Periscope.....Prepaid 10c



Musical Calliope. Latest novelty. Made in celluloid, light weight. 4 1/2" x 2 1/2". Eight keynotes produce perfect Calliope musical effect. Simple to play—just blow. Plays like Harmonica. Exceptionally loud. Finished in different, attractive colors.

No. 8521 Calliope.....Prepaid 15c



The real article! Conceal nose blower in your handkerchief and blow into instrument while you pretend to blow your nose. Everyone stops and looks at you. There never was a terrible noise like it. Keep it up as long as you like.

No. 8510 Noseblower.....Prepaid 10c



ACTUALLY MAGNIFIES 25 TIMES! Hair looks as big as a rope. Saw pores in your skin. Has double adjustable lens. For home, laboratory and shop. Full black enamel and clip. This little instrument must be seen to be appreciated.

No. 8503 Wonderscope.....Prepaid 35c



Stands entirely of brass as its bigger brothers. Lenses are scientifically ground. Nothing better made. Fits into pocket. Instrument is handsomely finished in gold lacquer brass and measures extended 8 1/4", closed 3 1/4"

No. 8504 Telescope.....Prepaid 55c

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Handsomely carved and filled ring. Looks just like any other ring. But, oh boy, wait till you look through the "VIEW." Strong magnifying glass shows French actress when viewed against light. Ring has large imitation diamond. When ordering enclose a strip of paper giving size of your finger.

No. 8511 Surprise Ring.....Prepaid 35c

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For the astonishing small sum of 25c you can now learn telegraphy. Any wide awake boy or girl can learn the telegraph codes with this little outfit within from 30 to 60 days. Gives loud signals perfectly—nothing to wear out. No batteries. The instrument consists of hand lever, mechanical sounder and telegraph key knob. Serves to table or carry it in pocket. Guaranteed to give easy reproduction of telegraph sounds just like regulation sets. We also furnish free a set of telegraph codes as shown, and full instructions of how to learn telegraphy.

No. 8525 Telegraph Set.....Prepaid 25c

NEW!!

Telegraph 25c

For the astonishing small sum of 25c you can now learn telegraphy. Any wide awake boy or girl can learn the telegraph codes with this little outfit within from 30 to 60 days. Gives loud signals perfectly—nothing to wear out. No batteries. The instrument consists of hand lever, mechanical sounder and telegraph key knob. Serves to table or carry it in pocket. Guaranteed to give easy reproduction of telegraph sounds just like regulation sets. We also furnish free a set of telegraph codes as shown, and full instructions of how to learn telegraphy.

No. 8525 Telegraph Set.....Prepaid 25c

NEW!!

Spinthariscopes

Positively the most astounding scientific instrument ever developed. This instrument formerly sold from \$1.00 to \$50.00 upwards. Now it is possible to get it for a small sum. Witness actual destruction of thousands of Worlds by simply looking through the lens of the instrument. Actual radium is disintegrated before your eyes. You see the atomic bombardment plainly. Instrument is guaranteed to contain a minute quantity of radium. There is no more enthralling sight in the whole world than what you see in the Spinthariscopes. Nothing to wear out. Lasts forever. Adjust by extending lens to right focus and watch the spectacle.

No. 8524 Spinthariscopes.....Prepaid 65c



Nothing to wear out. Lasts forever. Adjust by extending lens to right focus and watch the spectacle.

No. 8524 Spinthariscopes.....Prepaid 65c

CIGARETBANG



Here boys is THE novelty. Box contains a dozen tiny wood pegs—but they ARE "treated." Push the sharp end of peg into cigarette about 1/3 in. Pegs are so small they're invisible. Then offer your friends the cigarettes. BANG, BANG! they go off—YET ENTIRELY HARMLESS.

No. 8520 Cigarette-bang.....Prepaid 15c

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7 Shaves for a Postage Stamp

That is all it costs you to try this unique new shaving method—we stake everything on this free trial

GENTLEMEN:

The postman is our best salesman. For he brings the test that wins men to our new product. The product actually sells itself daily in the greatest laboratory of the world—America's bathroom.

Each morning hundreds of new users try Palmolive Shaving Cream at our expense. And 86% of them, we find, discard their former methods for it. Thus, our problem is to get men to take our test. To sign and mail the coupon.

If we can win so many millions in so short a time, surely you want to try this remarkable cream yourself. We do not want to sell you sight unseen. First let us prove our case—then you will want to buy.

Mail coupon—learn its 5 points

You risk nothing. We undertake, in 7 shaves, to win you. It's an open-and-shut proposition, and you are the judge. So won't you mail the coupon?

PALMOLIVE RADIO HOUR—Broadcast every Wednesday night—8:30 to 9:30 p. m., E.T.; 7:30 to 8:30 p. m., C.T.; 6:30 to 7:30 p. m., mountain time; 5:30 to 6:30 p. m., Pacific time—over station WEAF and 39 stations associated with The National Broadcasting Company.

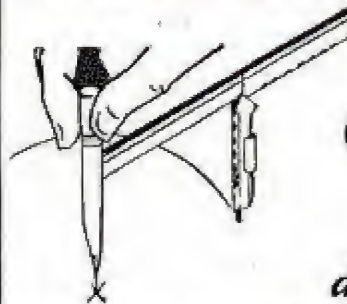


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Simply insert your name and address and mail to PALMOLIVE, P. O. Box 375, Grand Central Post Office, New York City

Please print your name and address



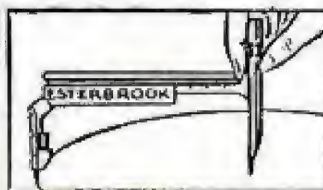
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*makes accurate
drafting work easy!*

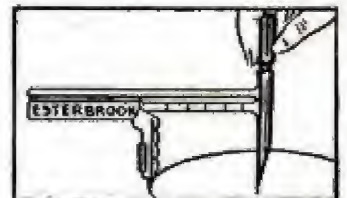
THERE are dozens of jobs on which you need a good compass—radio hook-up diagrams, lighting outlets—no end to its workroom uses!

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Above: Slide adjusted for long radius.



Above: Slide at the short radius.

new principle which prevents wobbling or slipping. Center-pin and pencil-lead are always parallel and vertical. Radius shown clearly and correctly on the beam, in inches or centimeters. Makes true circles from $\frac{1}{8}$ " to 8" diameters. With slide reversed radius is exactly 2" greater than scale reading.

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WATCH BOOK

We will send this famous Illinois watch, made and guaranteed by the Illinois Springfield Watch factory, express prepaid, for you to examine, to admire, to approve without one penny advance payment. Examine the watch and be convinced it's the best watch buy you ever saw. Just a small payment down, the balance in easy MONTHLY payments. You use the watch while paying for it.

JUST OUT!—NEW "SANTA FE" WATCHBOOK

Send for our New Watch Book—just off the press. All the newest watch case designs in white or green gold, fancy shapes and thin models are shown. Read our easy payment offer. Wear the watch 30 days FREE. Nothing to risk. See the watch before you buy. Write for New Book Today—it's FREE. Select Your Watch NOW.

FREE A limited offer! With every Santa Fe Special, a beautiful gold chain or strand of expensive pearls. Write today.

SANTA FE WATCH COMPANY, 96 Thomas Bldg., Topeka, Kan.

No forced landings when you take-off in Keds!

Keds help you keep your feet like a good engine keeps a plane in the air. With Keds' light, tough, springy action, you can give your athletic motor full "gun," and out-distance the field safely.

Keds help you win because they help you run, and save you many a spill.

Keds are safer for foot-health because Keds are *specially designed* sports and play shoes—much more than ordinary "sneakers."

Leading physicians and coaches endorse Keds, and hundreds of the world's noted athletes wear them. Many aviators and parachute-jumpers wear them, too.

Keds' special safety-soles grip the smoothest surfaces, and absorb the roughest shocks.

Remember that Keds offer the most complete assortment of styles and models for all indoor and outdoor sports activities. Keds are made by the world's largest specialists in canvas rubber-soled foot-

wear. You'll find Keds in the best shoe stores in town—at all prices, too, from \$1.00, \$1.25, \$1.50, \$1.75 up to \$4.00.

Keds—Keds—Keds—Look for that name stamped on all genuine Keds.

Write for free booklet on games, sports, camping, vacation suggestions and other interesting subjects. United States Rubber Company, Dept. KM-99, 1790 Broadway, New York City.

United States



Rubber Company

Makers of "U. S." Raynster raincoats, "U. S." Giant Chain bicycle tires, "U. S." Spring-Step heels, as well as

Keds

REG. U. S. PAT. OFF.

The more you pay, the more you get
—but full value whatever you spend.



Keds "Conquest" (BROWN)

Made with the popular crepe sole, famous for wear. A special toe cap reinforcement that will let you scuff to your heart's content. "Feltex" insole, and Keds' cool canvas upper.



Keds "Shortstop"

This handsome shoe puts lightning in your feet and protects you against slipping! Note the special safety-sole. Keeps your feet cool and gives them protection whether you're playing baseball or taking the jolts of the trail.



"He saves \$100 a month"

"See that man at the receiving teller's window? That's 'Billy' King, Sales Manager for The Browning Company. Every month he adds \$100 to his savings account."

"Three years ago he started at Browning's at \$25 a week. Married, had one child, couldn't save a cent. One day he came in here desperate—wanted to borrow a hundred dollars—wife was sick."

"I said, 'Billy, I'm going to give you some good advice—and if you'll follow it I'll let you have the hundred too. Take up a course with the International Correspondence Schools and get some special training.'"

"That very night Billy wrote to Scranton. In a few months he had doubled his salary! Next thing I knew he was put in charge of his department and two months ago they made him Sales Manager. It just shows what a man can do in a little spare time."

Employers are begging for men with ambition—men who really want to get ahead in the world and are willing to prove it by training themselves in spare time to do some one thing well.

Prove that you are that kind of man! The International Correspondence Schools are ready and anxious to help you prepare for something better if you will only make the start. Do it now! Find out what the I. C. S. can do for you. *Mail the coupon!*

INTERNATIONAL CORRESPONDENCE SCHOOLS Box 5638-F, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the course before which I have marked X in the list below:

TECHNICAL AND INDUSTRIAL COURSES

- | | |
|--|---|
| <input type="checkbox"/> Architect | <input type="checkbox"/> Automobile Mechanic |
| <input type="checkbox"/> Architectural Draftsman | <input type="checkbox"/> Aviation Engines |
| <input type="checkbox"/> Building Foreman | <input type="checkbox"/> Plumber and Steam Fitter |
| <input type="checkbox"/> Concrete Builder | <input type="checkbox"/> Plumbing Inspector |
| <input type="checkbox"/> Contractor and Builder | <input type="checkbox"/> Foreman Plumber |
| <input type="checkbox"/> Structural Draftsman | <input type="checkbox"/> Heating and Ventilation |
| <input type="checkbox"/> Structural Engineer | <input type="checkbox"/> Sheet-Metal Worker |
| <input type="checkbox"/> Electrical Engineer | <input type="checkbox"/> Steam Engineer |
| <input type="checkbox"/> Electrical Contractor | <input type="checkbox"/> Marine Engineer |
| <input type="checkbox"/> Electric Wiring | <input type="checkbox"/> Refrigeration Engineer |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> R. R. Positions |
| <input type="checkbox"/> Reading Shop Blueprints | <input type="checkbox"/> Highway Engineer |
| <input type="checkbox"/> Telegraph Engineer | <input type="checkbox"/> Chemistry |
| <input type="checkbox"/> Telephone Work | <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Mechanical Engineer | <input type="checkbox"/> Coal Mining Engineer |
| <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> Navigation <input type="checkbox"/> Assayer |
| <input type="checkbox"/> Machine Shop Practice | <input type="checkbox"/> Iron and Steel Worker |
| <input type="checkbox"/> Toolmaker | <input type="checkbox"/> Textile Overseer or Supt. |
| <input type="checkbox"/> Patternmaker | <input type="checkbox"/> Cotton Manufacturing |
| <input type="checkbox"/> Civil Engineer | <input type="checkbox"/> Woolen Manufacturing |
| <input type="checkbox"/> Surveying and Mapping | <input type="checkbox"/> Agriculture <input type="checkbox"/> Fruit Growing |
| <input type="checkbox"/> Bridge Engineer | <input type="checkbox"/> Poultry Farming |
| <input type="checkbox"/> Gas Engine Operating | <input type="checkbox"/> Mathematics <input type="checkbox"/> Radio |

BUSINESS TRAINING COURSES

- | | |
|--|---|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Business Correspondence |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Show Card and Sign Lettering |
| <input type="checkbox"/> Personnel Management | <input type="checkbox"/> Stenography and Typing |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> English |
| <input type="checkbox"/> Accounting and | <input type="checkbox"/> Civil Service |
| <input type="checkbox"/> C. P. A. Coaching | <input type="checkbox"/> Railway Mail Clerk |
| <input type="checkbox"/> Cost Accounting | <input type="checkbox"/> Mail Carrier |
| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Grade School Subjects |
| <input type="checkbox"/> Secretarial Work | <input type="checkbox"/> High School Subjects |
| <input type="checkbox"/> Spanish <input type="checkbox"/> French | <input type="checkbox"/> Cartooning |
| <input type="checkbox"/> Salesmanship | <input type="checkbox"/> Illustrating |
| <input type="checkbox"/> Advertising | <input type="checkbox"/> Lumber Dealer |

Name.....

Address.....

City..... State.....

Occupation.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

Play Tunes The Very First Day!



Be the Life of the Party



FREE!

Write for FREE particulars about Octophone and full details of 7-Day Trial Offer and Easy Payment Plan.

FERRY & CO.

1750 N. Damen, Dept. 177, Chicago, U. S. A.

with this remarkable new instrument—the OCTOPHONE. Many play tunes in few minutes! No knowledge of music required. No long, tiresome practice. No expensive lessons. Play tunes right from the start—and learn music automatically as you play.

8 INSTRUMENTS IN ONE!

"Octophone" is complete orchestra in one instrument—Ukulele, Tenor Banjo, Mandolin, Tenor Guitar, Mandola, Tiple, Taro-Patch, and Mando-Cello. Produces rich harmony, syncopated jazz. Astonish your friends. Loads of fun. Money-making chances in orchestras, radio and stage.

7-DAY TRIAL

in your own home. No risk. No obligation. Over 50,000 have learned to play this amazingly easy way. Easy Payments. Write today.

Agents: \$2 an Hour

taking orders for marvelous new free-lathering, all-purpose toilet soap. Made from South Sea Island plants. Lathers freely in any kind of water—hard or soft, hot or cold. Wonderful for face, hands, bath, shampoo—and baby. Tremendous demand. Nationally advertised. Thousands of sample cakes distributed. Priced amazingly low. Splendid repeater. \$2.00 an hour easily made.

New Ford Tudor Sedan GIVEN

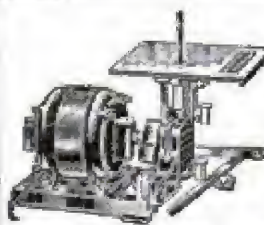
This wonderful soap is just one of the 350 fast-selling, profitable items in the ZANOL Line. Send no money—just your name. We'll give you the most amazing offer ever made, and show you how to get a New Ford Tudor Sedan FREE of cost. Write today SURE.



THE AMERICAN PRODUCTS CO.

2300 Monmouth Ave.

Cincinnati, Ohio



The International Motor Saw

does every sawing job from straight cutting to intricate scroll and design work: crosscuts, rips, miters, bevels, inside and outside jig sawing and scroll cutting. One saw instead of several.

Write for full description. Dept. S. The International Stamping Co., 400 N. Leavitt St., Chicago, Ill.



VICAM STANDARD

MOVIE CAMERA

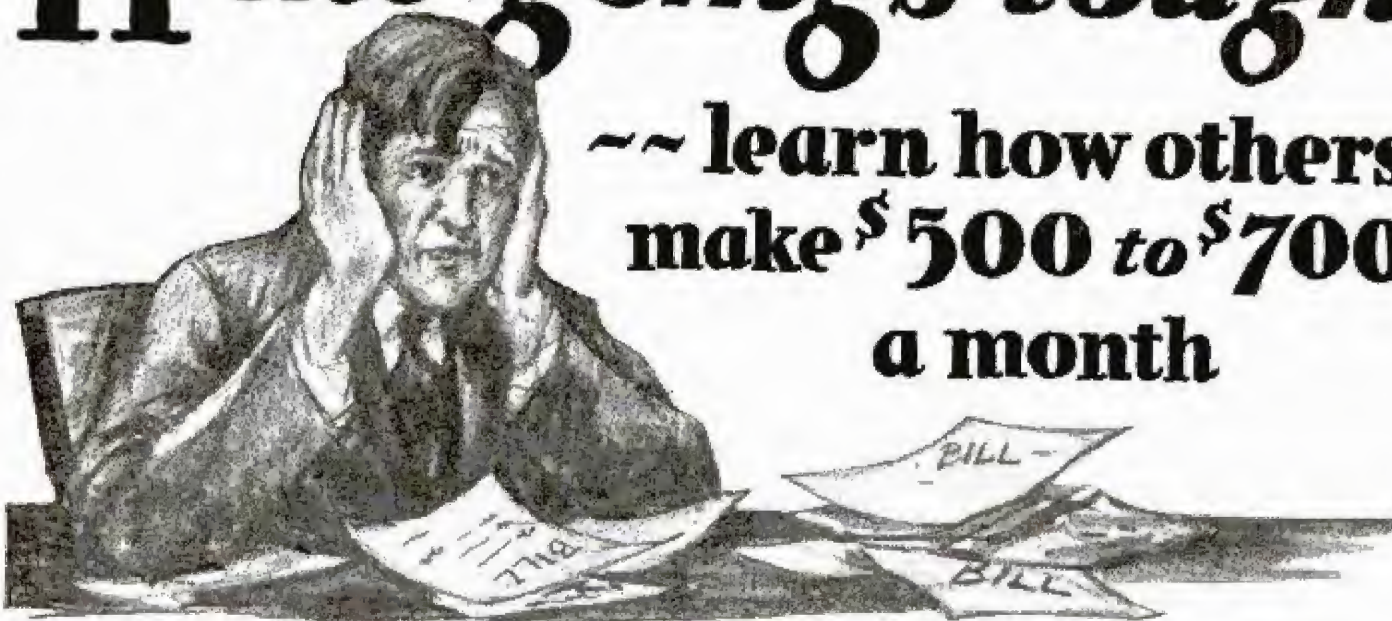
Make your own action movies of events, trips, parades, etc. Takes 25 feet of standard film. Equipped with F.5 universal lens. Loads in daylight. Films developed free.

Film can be projected from any standard projector. Order today C. O. D. or send 10c in stamps for illustrated booklet.

VICAM PHOTO CO. 1224 Belmont Ave. PHILA., PA.

If the going's tough

~~ learn how others
make \$500 to \$700
a month



DON'T let the wage struggle lick you! There's a new profession calling you to earn \$500 to \$700 a month. Over 1600 Popular Mechanics readers are in it today.

Get an outline of the facts here and then write for more complete information than we can give you in this brief ad. Not a bit of cost or obligation to mailing the coupon printed below.

FLORKRAFTSMANSHIP Needs Men

Perhaps you've heard about FlorKraftsmanship. You may have read an ad like this and figured some day you'd get the facts. But these other men no smarter than you *did* get the facts—and now they're making the money. They're full fledged Clarke FlorKraftsmen.

You can do what they've done—but not by putting it off still longer. The income the Clarke Vacuum Portable Sander offers to you is:

\$25 to \$75 a Day

How can you earn \$25 to \$75 a day in the easy, inside job of Clarke Floor Surfacing? The Clarke Vacuum Portable Sander surfaces 800 to 2,000 square feet of new floor in 8 hours. The pay is 3 to 5 cents a square foot. That's \$24 to \$100 a day!

Don't confuse Clarke FlorKraftsmanship with the old time, laborious method once used to sand floors. The Clarke Vacuum Portable Sander weighs but 31 pounds—runs off a light socket—operates almost as easily as a vacuum cleaner. The machine does the work. You simply guide it. After a few hours practice you can go out and earn a big day's pay right alongside any veteran

sanding man. There's no course of study to take and no books to buy.

Many FlorKraftsmen make most of their money re-surfacing old varnished floors. The powerful, fast-cutting Clarke bites off 2 or 20 coats of old varnish at the rate of 300 to 1,000 square feet every 8 hours.

The pay is 7 to 15 cents a foot, depending on condition of floor. But even at 7 cents and assuming that you do only 300 feet a day, that's \$21 for 8 hours. And any experienced Clarke FlorKraftsman will get far more than 300 square feet in a day—600 is a fair average.

More Men Needed

The market needs several thousand FlorKraftsmen today. You don't need an office or any other expensive equipment. About a hundred dollars is all the money required to start into this big pay work.

Get going now and be among the next hundred men to get into this big pay class. It will pay to get the free facts—and the coupon below will bring them to you direct from Clarke, the pioneer maker of Electric portable sanding machines.

Simply mail this coupon. Get the facts. Then decide for yourself. Act now. There is no charge, no obligation and you can prosper in this business.

Clarke Sanding Machine Co.

Dept. T-29

3831 Cortland St. Chicago, Ill.

Originators and for 12 years manufacturers of Portable Sanding Machines

MAIL THIS COUPON

Clarke Sanding Machine Co.,
Dept. T-29, 3831 Cortland St.,
Chicago, Ill.

Gentlemen: Please send me your free booklet, "Pointing The Way," and full facts about the Clarke Sander and about FlorKraftsmanship, without obligation to me.

Name.....

Address.....

City..... State.....

What They Earn

"From April 1st up to noon April 16, have earned \$259.00." —Avery Lee.

"I made \$45 the first week and have about \$500 of work lined up now. I am perfectly satisfied with the machine." —D. S. Sall.

"I have made from \$40 to \$45 per 8 hours, with my Clarke." —W. G. Roe.

"I made \$76 the first week." —A. F. Sweeney.

"I have already taken in \$348 for work and have 1,100 feet of floors to do yet." —H. O. James.



WURLITZER

Trade Mark Reg.
THE WORLD'S LARGEST MUSIC HOUSE



200 Years Ago in the little Saxon town of Schmiedefeld lived Hans Adam Wurlitzer, Master Violin Maker. His shop was a gathering place for musicians of the time, for he was a true craftsman.

When he died his shop passed into the hands of his eldest son, and for seven generations, down to the present day, the descendants of Hans Adam Wurlitzer have carried on his work.

Today in every Wurlitzer instrument you will find a quality, a character, that could not come from mere excellence of manufacture. It is the heritage of these seven generations of music craftsmanship.



Try any Wurlitzer Instrument in your Own Home

YOU may now have any Wurlitzer instrument for a generous free trial in your own home. Examine the instrument, show it to your friends, play it as much as you wish. No obligation to buy—no expense for the trial. We make this liberal offer because we want you to try for yourself these wonderful instruments, the result of 200 years' experience in musical instrument building. Easy payments are arranged to suit your convenience. This is your opportunity to try a famous Wurlitzer instrument in your own home.

Send for New Catalog

The greatest musical catalog ever published. Over 3,000 articles—every known instrument described and illustrated; many of them shown in full colors. Gives you lowest prices and all details of Free Trial, Easy Payment plan. All sent FREE—no obligation.

Send this Coupon

THE RUDOLPH WURLITZER CO., Dept. 1776
117 E. 4th St., Cincinnati

Send me absolutely free, your new illustrated catalog, with prices and description of every known musical instrument. Also tell me how I may try any instrument in my own home and pay for it in small monthly sums. No obligation.

Name.....

Address.....

City.....State.....

Instrument.....
(State instrument in which you are interested)

Copyright, 1929, The Rudolph Wurlitzer Co.

Build a Ship Model at Home

For Pastime and Pleasure



It is a wonderful fascination and a beautiful decoration for your mantel, radio cabinet or it may be used in any part of the home.

Santa Maria—Size—25" high, 10" wide, 27" long.....\$4.98

La Pinta—Size—26" high, 11" wide, 27" long.....\$4.98

Mayflower—Size—26" high, 10" wide, 30" long.....\$4.98

Constitution—Size—25" high, 8" wide, 29" long.....\$6.98

Flying Cloud—Size—27" high, 9" wide, 36" long.....\$6.98

These prices are f.o.b. Philadelphia, plus a few cents postage.

These models are sold in knock-down form. All parts are cut to fit and ready to assemble. They will be sent anywhere in United States C.O.D.

Money order or check must accompany all foreign orders.

Write for free illustrated catalog

MINIATURE SHIP MODELS, Inc.

3216 BARING STREET

PHILADELPHIA, PA.

Do Better, Faster Work with H & A Saw Table



A sturdy, powerful, large capacity machine that will handle wide material. Accurate, speedy, reasonably priced. Use it for ripping, cross-cutting, mitering, grooving, rabbeting or dadoing. Equipped with tilting fence for bevel sawing. 1/2 or 3/4 H. P. motor. All bearing spindle. Write for catalog of woodworking tools.

HESTON & ANDERSON, 609 Market St., Fairfield, Iowa

ELECTRIC LIGHTS ANYWHERE

110 Volt—complete plant with all Wiring, Fixtures and Lamps for 7 rooms \$147.50, Direct-To-You.

Ideal for Farms, Camps, Summer Homes.

Also runs Household Electrical Appliances. Install it yourself. Write for circular.

D. W. ONAN & SONS \$147.50
20 Royalston Ave.
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Big Steady Pay— \$95.00 Show Our \$25.00 weekly!

ALL-WOOL Tailored Suits

If you are ambitious to make money, we want you as our representative. Show wonderful values in union-made tailored-to-order Suits and Overcoats. Take orders. Easiest work, biggest earnings.

Pay Daily and Liberal Bonus

No selling experience required. Customers save \$10 to \$15. Satisfaction guaranteed or money back. Repeat orders bring steady, permanent income. Nearly 200 fabrics, carrying complete supplies. FREE. Write at once for local territory. Give complete details for immediate consideration. Outfit Sent Free.

PIONEER TAILORING CO., Dept. J-1115
Congress and Throop Sts. Chicago, Ill.



Filters a Gallon Every 4 Minutes



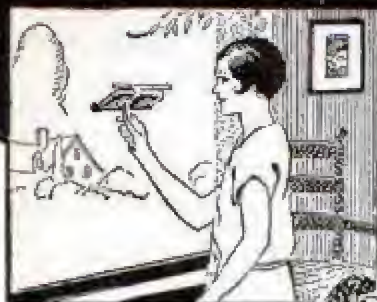
Low Priced—Guaranteed

Amazing new invention—patented Home Filter for fruit juices and beverages. Nothing like it. Removes all sediment, pulp, fibres. Filters a gallon every 4 minutes. Perfect results guaranteed. No moving parts. Simple. Practical. Low priced. Lasts a lifetime. Thousands already in use.

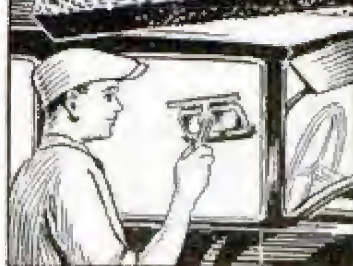
FREE HOME TRIAL—Agents Wanted

Try free at our risk and return if not satisfied. Send name and address TODAY for full particulars of this liberal offer. Act NOW. AGENTS WANTED. HOME FILTER CO., 429 CENTRAL AVE., BAY CITY, MICH.

Amazing New Window Washer



**For homes,
autos, offices,
stores, factories
—wherever there
is glass to clean
Sells for \$2.25**



Make \$25 to \$35 a Day. A Marvelous Opportunity That Leads the Way to Your Financial Independence

HERE it is at last!—An amazing invention that cleans windows in a jiffy, does away with water pails or sponges, prevents hands from getting wet or cold and absolutely eliminates all drudgery. Works like a charm. Operates three times as fast as any other method. Makes an instant appeal to every housewife and car owner as well as stores, factories, offices, etc. The Carter Window Washer sells like wild fire. The money-making opportunity for agents is simply amazing. \$25 to \$35 a day is easy. Hundreds of men and women are becoming financially independent by selling this marvelous device. You can do that, too. With our plan, you start as small as you like and quickly work up into the big money class.

Quick Demonstration—Sell on Sight

Carter Window Washers are easy to use. No parts can rust or get out of order. No instructions necessary. Quickly demonstrated right on the glass door of any home or nearby window. Any housewife understands its use and advantages in a few seconds. A thorough demonstration is completed in a minute's time and everybody wants one. No clever salesmanship required—just a courteous approach and a simple, quick demonstration.

Sell Every Home — Every Auto

There is an astounding market in every city, town or village for the Carter Window Washer. Every home needs one; every auto driver should have one in his car; stores need them for show-cases. Wherever there is glass to clean there is an opportunity to sell a Carter Window Washer.

Sales come quick and fast. You find business wherever you go. Simply show this great invention to every home in your town and write up the orders.

Tremendous Margin of Profit

We give our agents an extraordinary margin of profit so that every sale at \$2.25 means a lot of money in your pocket. Here is the biggest money-making opportunity you ever had. Get in on it right away.

We are fast building up a large organization of money-makers throughout the country. New agents in every section are wanted. Get our complete proposition—make big profits—be independent and run your own business.

ESTABLISHED SALES FORCES Can Triple Profits

One salesman can make \$100 a week and more by his own efforts but managers of crews can multiply this income many times according to the size of their sales forces. Tell us what territory you cover thoroughly and we will explain sales quota required.

MAIL THIS COUPON **NOW**

Carter Products Corporation,
Dept. A-1, 983 Front Ave.,
Cleveland, Ohio.

I want you to show me how to make \$25 to \$35 a day.
Send me full particulars.

Name.....

Address.....

☐ Check here if you send \$1 for sample.

Send \$1 for Sample—

Take that sample and in one hour's time demonstrate the Carter Window Washer to nine homes. If you don't make three sales, return sample and we will refund your money.

CARTER PRODUCTS CORPORATION
Dept. A1 — 983 Front Ave., Cleveland, Ohio

**"\$3.00 Spent on This Room
NOW... Will Save You \$100!"**



Amazing Strips of Lifetime Bronze

Save Home Owners \$30 to \$60 a Year!

NO More Big Fuel Bills! No More Cold, Draughty Rooms! No More Dust, Soot, and Smoke! Amazing New Invention Is Creating Thousands of Big Money Opportunities for Live-Wire Representatives, Red-D-Ply. New Kind of Metal Weatherstrip That Anyone Can Apply to Any Door or Window in a Few Minutes Does the Trick. Keeps Cold Draughts Out, Heat In! Guaranteed to Save Its Trifling Cost in Two Winters! Snap Up This New Money-Maker Now!

"Our coal bills cut in half!" "Saved \$50 in a single winter!" "Not a luxury—a real investment." Folks have hitherto thought of metal weatherstripping as expensive, and difficult to install. Imagine their delight when you show them Red-D-Ply! Each package contains material to completely weatherproof any door or window in half an hour, with no experience and no tools but a tack hammer and scissors! Slides into position without removing sashes or doors. Completely closes chinks and cracks where cold draughts sneak in to steal heating dollars, besides causing endless discomfort and sickness. Red-D-Ply also keeps out rain, dust, and soot. Makes windows slide easier and banishes rattles! Does away with storm windows and doors. Is it any wonder Red-D-Ply offers such amazing profits to representatives?

**A Double-Barreled Money-
Maker for Agents
\$400 to \$600 a Month
The Year Round!**

Just Count Windows and Doors!

A single block, even in small towns, may yield you as much as \$200 or \$300 in quick commissions! Just count the outside doors and windows in any home, figure up the fuel savings Red-D-Ply will give, and your sale is already half made! For Red-D-Ply is **GUARANTEED** to save its cost in two winters—and ordinarily does it in one! The cost averages about the price of an auto tire. And the saving goes on year after year—for no matter how windows and doors swell or shrink Red-D-Ply **AUTOMATICALLY** adjusts itself to suit.

Repeat Business—Installation Profits

The repeat business is simply enormous! Even if you don't sell a complete installation on the first call, make a test installation of one room or so—then come back for order after order, and

make the same or greater profit every time. Make extra money through installations.

Territories Going Fast—Act at Once!

Red-D-Ply offers such surprising profits in a new non-competitive field that hundreds are dropping everything to take over territory. Exceptionally generous proposition, with ready-cut selling plan absolute proof against failure. It insures repeat business. New buildings alone furnish a wonderful field—112,754 new homes built in 1928 need Red-D-Ply. We furnish everything to start a permanent, profitable business. This is only half the story. Will you risk a 2c stamp to hear the rest, if it means \$5000—\$7500 a year to you? Then mail the coupon for full particulars and a **FREE SAMPLE** of Red-D-Ply. No obligations. Get the facts and judge for yourself if this is not the proposition you have waited for all your life.

Red-D-Ply Mfg. Co.

Dept. M-10 3711-15 Parnell Ave. St. Louis, Mo.

GET FREE SAMPLE

Mail Coupon

RED-D-PLY MFG. CO., Dept. M-10
3711-15 Parnell Ave., St. Louis, Mo.

I want to make \$5000 a year or more. Send Free Sample of Red-D-Ply and full details of your proposition to Representatives. I am not obligated by this request.

Name.....

Address.....

City.....State.....

Red D Ply

The Universal Weatherstripping—Anyone Can Afford
It... Sell It... Install It



Makes \$18 First Day

"Received my first 24 Speedos yesterday; the entire lot is now delivered and more sold. In all my years of selling I never saw anything that met with such universal approval."
—W. K. Duncan, Mount,



\$5.00 His First Hour

"Received Speedo outfit April 1st. Left the house at 8:30 P. M. Returned just one hour later with 4 orders. Speedos are a necessity in every home."—W. W. Marshall, Ill.



**Let These Twin
Inventions Hand You**

Double Profits...\$5 to \$11 IN AN HOUR!

Men, here's a proposition that's amazingly simple. Yet the profit possibilities are nothing short of startling! For now, an old, well-known manufacturer offers you direct, TWO unique, patented inventions. Items used every day in every home. Yet so revolutionary that they positively sell on sight! So just read the facts below. Then mail coupon for FREE OUTFIT and FREE TEST OFFERS.



Works Like a Charm

Just insert can in holder and turn crank. Top is cut completely out inside the rim. Juice can't spill out.



Food Pours Right Out

No fuss or muss. No scraping or "spooning" out. Even foods frozen in the can slip out easily.



No Jagged Edges

Speedo cuts the top out, smooth, slick, and clean. Ends danger of cut fingers.

EVERY man who has cut his eye teeth in the selling game knows this! The big clean-ups are always made by men who get in on the ground floor with something new and sensational. Think, then, what a doubly sensational chance to coin money is now yours! For here are offered you two unique devices — pronounced by experts everywhere to be absolutely revolutionary—approved by Good House-keeping Institute, Modern Priscilla, etc.—and real necessities in every home. In your wildest dreams, could you conjure up such an amazing opportunity for quick, easy profits?

A Real Million-Dollar Can Opener

Imagine an automatic machine that opens any can, round, square or oval, simply at the turn of a crank. Cuts the entire top out, slick, smooth and clean! No more stabbing and hacking with old-style can openers. No more fingers cut and infected on jagged tin-can edges. For Speedo holds the can—strips the top out—flips up the lid—all in a couple of seconds! No wonder women simply go wild over it. And no wonder 4 out of 5 buy on a 10-second demonstration!

The "Magic Groove" Sharpener

Women never saw anything even remotely like this other "twin" invention, the Speedo Sharpener. Just

demonstrate the "Magic Groove" and watch their eyes pop open with amazement. Now anyone can put a keen, smooth edge on everything that cuts. Even scissors! Every woman sees instantly that here is an end to the drudgery of dull knives and tools. That's why agents report as much as \$10 and \$12 in a single hour with Speedo sharpener alone!

Generous Co-operation

This company has been in business over 20 years. Speedos are made entirely in our own big factories, under exclusive patents. Each item is backed by a printed guarantee of 5 years' perfect service. We give you exclusive territory. Over 100% profit! We train you from A to Z, and supply you with a complete selling outfit FREE.

Mail The Coupon TODAY

Any ambitious man with just ordinary common sense can see the possibilities of the proposition at a glance. If you are that kind of a man, I want to send you my FREE OUTFIT and FREE TEST OFFERS. I want to show you what real big money means. Mail the coupon today. Then get set to test the fastest, dizziest profit makers of your life. Write me this minute!



Sharpens Like Magic
Just rest blade on Magic Groove, turn handle. Sharpens a ten-inch knife in six seconds. Puts a razor edge on everything that cuts.



Grinds Polishes Perfectly
Rest blade against guide, give handle a couple of turns—Presto! Scissors are sharp as new.

Central States Mfg. Co., Dept. L-703,
4500 Mary Ave., St. Louis, Mo.

Rush me details of your proposition and FREE TEST OFFER.

Name.....

Address.....

Town.....State.....

☐ Check here if interested only in one for own home.

**CENTRAL STATES
MANUFACTURING CO.**

Dept. L-703, 4500 Mary Avenue, St. Louis, Mo.

*It's all the same to
me—just so I get a*

CAMEL

